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AUGUST, 1900. VOL. XVI. NO. 2.

The Geographical Journal

INCLUDING THE PROCEEDINGS OF THE ROYAL GEOGRAPHICAL SOCIETY.

SUMMARY OF CONTENTS.

(For Details, see over.)

	PAGE
Journeys in Central Asia. By Captain H. H. P. DEASY	141
Through Africa from the Cape to Cairo. By EWART S. GROGAN	164
The Patagonian Cordillera and its Main Rivers, between 41° and 48° South Latitude. By Dr. HANS STEFFEN	185
Ancient Trading Centres of the Persian Gulf. By Captain ARTHUR W. STIFFE, R.I.M.	211
Dr. Jovan Cvijić's Researches in Macedonia and Southern Albania	215
The Monthly Record	220
Obituary	236
Correspondence	238
Meetings of the Royal Geographical Society, Session 1899–1900	241
Geographical Literature of the Month	242
New Maps	261
Maps and Illustrations.	

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The
Geographical Journal.

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JOURNEYS IN CENTRAL ASIA.*

By Captain H. H. P. DEASY.

For several years I had looked upon the portion of the map of Tibet marked "unexplored" with the greatest interest and curiosity, but it was not till the spring of 1896 that I eventually obtained sufficient leave from my regiment to undertake a journey into this prohibited and but little-known area. I was very fortunate in having for a companion my friend Arnold Pike, with whom I had travelled in the Caucasus some years previously. The object of the expedition was to survey as accurately as possible as much of the unexplored parts of Tibet as circumstances would permit. Being most anxious to carry on triangulation, and to ascertain the heights of the principal peaks, it was necessary to sacrifice to some extent linear for square measurement. In order to enter this inhospitable country without meeting any of its inhabitants at the outset, it was decided to travel by the celebrated valley of Kashmir to Ladak, and thence to the Lanak La pass.

After a brief stay in Srinagar with the hospitable Captain G. Chenevix-Trench, we left the City of the Sun for Leh, the capital of Ladak, or Kashmirian Tibet, on April 27, when the Zoji La, the pass over the Western Himalayas, was still deep in snow. The latter was, moreover, in that intermediate stage when it is most inimical to traffic, as it was soft enough to retard considerably the progress of the 105 coolies carrying our baggage. Leh was, however, reached without misadventure, and here, through the great kindness of Captain Chenevix-Trench, who had purchased for me twenty-five splendid mules in the

* Read at the Royal Geographical Society, April 2, 1900. The map will be issued with the next instalment of the paper.

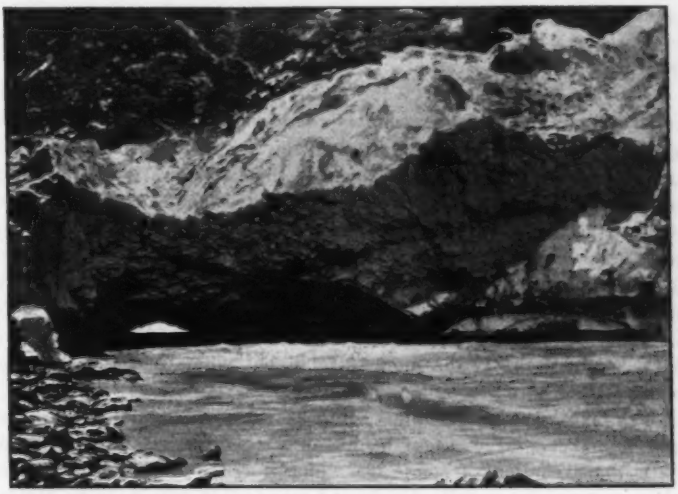
previous autumn, and arranged for the supply of the balance of transport animals in the spring, no delay was experienced on this head in the organization of the expedition. As soon as minor matters had been attended to, supplies obtained, bread made, the loads weighed, and the details of the caravan equipment attended to, it was despatched from Leh on May 25, in charge of sub-surveyor S—— D——, whom we christened Leno, a few days ahead of us, as the Chang La was still impracticable for animals, necessitating a *détour* for them.

The wretched village of Fobrang, not far from the Pangkong Lake, where our remaining stock of barley, suttoo, etc., was obtained through the good offices of the Wazir of Ladak, was the last village we were destined to see until our return to British territory in about five months' time. Our caravan of sixty-six baggage and riding ponies and mules, although aided by several yaks, had great difficulty in crossing the Marsemik La, which, though free from snow on the Fobrang side, was still deeply covered with it on the Tibetan side. The animals soon began to flounder about in the deep and soft snow, and in a very short time after beginning the descent, most of the loads of the first section of the caravan were strewn over the track in deplorable confusion. Finding it hopeless to reach the small camping-ground of Rimdi with the whole expedition in a single day, I had the tents, bedding, cooking-things, etc., loaded up on the freshest beasts, which contrived to struggle on through soft snow, often up to their girths, and thus reached Rimdi before dark, while the unfortunate caravan, both the men and their charges, had to face a bitterly cold night in a bleak, barren, and cheerless spot close to the pass.

Having overtaken the sheep, most of which carried 20 lbs. of barley, and the hired transport close to the Lanak La, which, though 18,000 feet, was perfectly free from snow on June 18, it was decided to halt for a day before entering the to us unknown land of Tibet. Our intention was to follow Bower's route more or less closely for a few marches; then keep to the north of it, so as to visit the north shores of Horpa or Gurmen Cho; and subsequently to travel east, keeping away from Bower's and the Polu route. The western end of the wide valley in which Mangtsa and Horpa or Gurmen Cho are situated being suitable for triangulation, a halt was made there to admit of measuring a base and obtaining a trigonometric value for longitude by means of the peak fixed by the Great Trigonometrical Survey of India, and known as Mangstza Lake, No. 1 peak. Unfortunately, neither the height of this prominent peak nor of Tartary peaks Nos. 1 and 2 had been previously determined, so all the heights shown on my maps of "Portion of Tibet," etc., are based on the readings of a portable mercurial barometer kindly given to me by Prof. Norman Collie, F.R.S., and not on the height of any peak fixed by the Great Trigonometrical Survey of India.

After crossing the Lanak La, neither guides nor information

about the country were obtainable, as the Tankse men who accompanied us as far as Horpa or Gurmen Cho, denied all knowledge of places or route east of this pass. Perhaps it may be interesting to note that the minimum thermometer fell to + 8° or 24° of frost during the night of June 16 at camp 1, the altitude of which is 17,450 feet. Measuring bases at camp 11 was made more tedious and complicated by the men who were sent to erect pillars at hill stations having done so, in two cases, on the sides of mountains instead of on the actual summits, as they were ordered. Unfortunately, these mistakes could not be noticed until I got close to the pillars. From the neighbourhood of this camp most extensive views are obtainable, the finest being that of the snow range



SNOW BRIDGE ON DRAS RIVER.

south of Horpa or Gurmen Cho. Some of the peaks in this range proved to be over 21,000 feet, being considerably lower than a fine double peak on the range south of the Aksai Chin, which is 23,490 feet.

Soon after starting from camp 13, Pike, who was on ahead of the caravan in pursuit of yak, saw a large lake in the distance, so we deviated from our course in order to check its position. This proved to be Yeshil Kul, a most cheerless place to camp by, on very soft ground thoroughly impregnated with salt, and destitute of either grass or fresh water. Fortunately for me, two small springs with a fair amount of grass close by were found not far from the south-east corner of the lake, and camp was moved to the most northerly spring. As it is in a most exposed place, it was by no means a pleasant place to halt in for ten

days, most of which I spent in bed with high fever. For a short time I was quite in the dark as to the nature of my ailment, but after as diligent a study of that excellent book 'Moore's Family Medicine of India' as was feasible, I either diagnosed the case or imagined I did so, and then turned to lighter literature. During the enforced halt at camp 15, or fever camp, the sub-surveyor made a short excursion for topographical purposes, and shortly after his return to this bleak and most uninviting spot, where one of the men became seriously ill and several ponies died from the severity of the weather, we gladly struck camp and moved eastwards.

Yeshil Kul, like most of the lakes we visited, must have been formerly considerably higher, and covered a very much larger area. After passing a very small salt lake close to the big one, we once more found ourselves in a country with plenty of grass and a moderate amount of fresh water.

Between camps 19 and 20 one of the most striking sights lay to the north of our route. The country was simply alive with antelope, females and young ones only, and, owing to the thousands seen, the name "Antelope Plain" was given to this, comparatively speaking, fairly level ground. As Pike, who reconnoitred for some distance east of camp 20, reported that as far as he could see, which was for many miles, in a very broad valley, there was neither grass nor water, and as the animals were by no means in a fit state to go on, with only a few handfuls of corn each, we very reluctantly decided to retrace our steps for one march, and follow the line which both of us had previously considered to be probably the more suitable, but which had been rejected owing to its leading too much south of east.

The extensive snow range south of camp 20 rendered it necessary to make a large *détour* before an eastward course was resumed. With the exception of camp 20, which was on the shore of a lake whose waters are so full of soda and other substances as to be almost undrinkable, fresh water was always obtained, but at one place the stream by which we camped only flowed for a few hours daily, being fed by the melting of the glaciers on the south side of the valley. When close to Aru Cho the scheme of going for at least a few marches along Bower's route was much favoured for a short time, but the country south-east of that lake, which was *terra incognita* to us, allured us in that direction. Considering it unwise to halt long near Aru Cho owing to the enfeebled state of the mules and ponies, I was successful in fixing the heights of only a few of the fine snow-peaks west of Aru Cho. It was not long before we bitterly regretted our keenness for keeping away from Bower's route, but, alas! it was then too late to return to it. Thinking that the alleged inability of the caravan to find all the animals at camp 31 was due to their being anxious for a day's rest, and as we had not the slightest idea that there were any

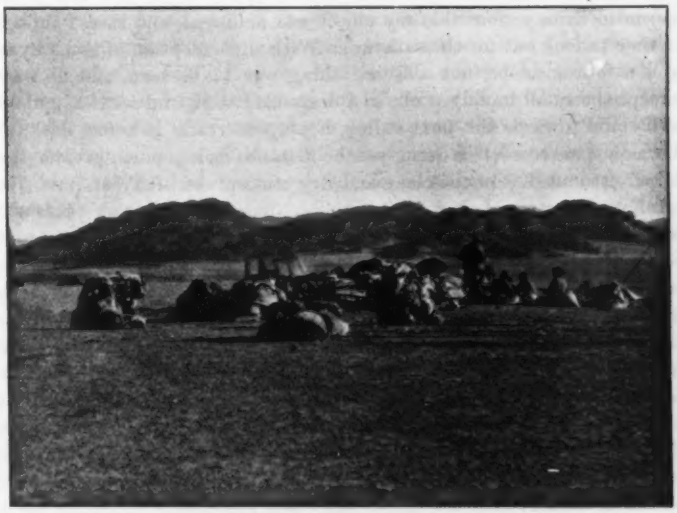
inhabitants near, we decided to leave three men behind to search for the eleven missing animals, and to rejoin us as soon as possible. To our dismay, one of these men turned up early on the second day at the next camp with the news that a few chukpas, or professional robbers, had visited our old camp soon after our departure, that they had stolen as much as they could carry away, and that one of our men was missing. At a council of war hastily convened after the receipt of this crushing news, it was decided that Pike with an escort of three men should track the chukpas to their tents, after despatching the baggage not appropriated by the robbers to the headquarter camp, while I remained behind to guard the camp and see that the animals were tied up and watched at night. I fully expected the chukpas to be watching the camp, and that as soon as Pike and his men had got well away they would pay me a visit. Hoping to encourage them and crediting them with very faint hearts, I ordered the men left behind after a search party had been sent away to look for the missing man, to remain in their tent, with the exception of one man whose duty it was to prevent the animals from straying far. As I felt very doubtful about any of the men keeping awake in the small hours of the morning following Pike's departure, I turned out at 2 a.m. and did sentry-go till daybreak. This proved to be by no means a needless precaution, as the previous sentry had allowed most of the animals who were tied up close to camp to break loose. Much to my disappointment, the chukpas did not honour me with a visit, but contented themselves with the booty already obtained.

In the afternoon of the day after Pike's departure, my mind was relieved from a considerable amount of anxiety when I saw him accompanied by the three men approaching camp. His very plucky punitive mission had been so well carried out that the chukpas, who were fortunately in very small numbers in the immediate vicinity of those whom Pike called on at the early hour of daybreak, were completely surprised. When the first of the band left his tent he must have received a rude shock to his feelings, as he found Pike's revolver in close proximity to his head, and if his disturbed brains permitted, he might have noticed the rest of the force close by with their carbines presented at him. There was no sign of the missing animals, and as there were several tents and numerous yak not far off, Pike considered it expedient to be satisfied with recovering all the property stolen from us, and taking away as ransom the only two ponies that were near and the chukpas' arms. During the fighting that took place, two robbers were wounded and, as we were told long afterwards, subsequently died of their wounds, much to the gratification of our informant, a Tibetan who acted as our guide on our enforced return journey to Ladak. Further delay in hopes of getting back the lost animals, which were the best and most sound-backed, being waste of valuable time, we

decided to go south-east, or as near that direction as the country would allow, in hopes of soon meeting inhabitants. The only point which was perfectly clear was that it would be madness to think of retracing our steps to Ladak, as all the animals were in far too emaciated a condition to reach British territory, or anywhere near it. None of our men had the slightest knowledge of the country, and ours was limited to what is afforded by a blank on the map. In order that the chukpas should not benefit any further from us, we burned everything that would burn, including a Berthon boat, which was the most inflammable article of baggage, and destroyed the superfluous things which could not be disposed of by flames. Our large stock of bovril and other food-stuffs prepared by the Bovril Company, as well as all other stores, spare shoes, nails, etc., were brought on for another march, and "cached" on the off chance that some other traveller may find them useful. The tents that could not be carried were soon used up by the caravan-men for clothes, a very welcome addition to their scant and ancient wardrobes, as they had expended on clothes in the legitimate way little or none of the allowance given to each man before starting. Owing to the mountainous nature of the country, we were obliged to steer in a more or less southerly direction.

After leaving camp 33, where our stores, etc., were cached, we followed a well-defined trail, trusting that it would lead to some inhabitants from whom we hoped to obtain fresh transport; but after some miles it suddenly pegged out, and, judging from the numerous offshoots from it, must have been made by kyang and game going to and from water, which was now exceedingly scarce. Distrusting the freshness of the large lake in the distance, we tried to obtain water by digging; but, finding this plan of no avail, I went on a short distance, and from the top of a low ridge saw a few pools of water with a profusion of excellent grass all around, so I signalled to the caravan to follow me. Pike was so seedy, it was marvellous how he managed to last out this march; and, plenty of excellent grass being close by, it was deemed advisable to halt for a day by these small pools of water of very inferior quality. During the halt I went off in search of water, and to reconnoitre for the next march. The result was most disappointing, as the very necessary water was nowhere to be seen from the commanding peak I ascended, except at a great distance in a south-westerly direction, but there was a profusion of grass. Trusting to find water by digging lower down in the valley, where I had seen a stream, we chanced this plan of quenching our thirst, but without avail. The stream had been so thoroughly absorbed by the porous nature of its bed that not a drop was to be had. Pike, with his usual energy, and although still weak, went up a fairly high hill above where camp was pitched to try and discover water, or some more likely spot in which to dig for that precious liquid. From this hill very

distant views were obtained, but no water, except that which I had previously seen, was at once discerned; however, the presence of some tents and yak 5 or 6 miles away cheered us up. Although the men had been warned to husband the supply of water which each one started with from the previous camp, all of them consumed their supply on the march, the only person besides Pike and I who bore in mind the warning being S—— D——. Some of the men having expressed a wish to go in search of water, leave was given them, and although there was bright moonlight all night, and camp was at the foot of a prominent and outlying hill, these men lost their way, and did not return to camp till the next morning, when they came in from the opposite direction to that which they had taken when setting out.



CAMP SCENE IN TIBET.

As the occupiers of the tents seen by Pike might be inclined to relieve us of more animals and baggage if opportunity offered, we thought it best to approach their camp well armed and accompanied by several men, who in all probability would be of far more use with their tongues and heels than with the magazine carbines with which they were armed. In the preliminary negotiations there was a very fair chance of obtaining a guide and some yak, but unfortunately the surly headman of these nomads proved to be as unwilling to accept a present as to allowing the people under him to satisfy any of our wants. After this interference nobody would consent to guide us anywhere, even for a few marches, except for the monstrously exorbitant demand of

100 rupees, which we declined to give. After much talk, the caravan bashi Ramzan, who has now gone back to his original profession of tailoring, induced some of the nomads, under the pretence of giving them medicine, to return our visit the next day, when one of them finally consented to indicate what direction we should take for the modest sum of five rupees, while his companion was detained in camp nominally to answer our queries. This arrangement proved very disastrous to me, as, when I was shown what direction to take, an erroneous one was pointed out. When starting the next morning, a couple of hours ahead of the caravan, I foolishly followed it, and came across a pool of muddy water. After resting for a short time, I went up some hills close by, hoping to get a good view of the neighbouring country, but other heights intervened, and it was not till I had ascended three or four that my object was achieved, and then I thought it time to look out for the caravan. With the exception of some kyang and a few antelope, not a living thing was to be seen, and no water except the small muddy pool; so I descended to it, and went as quickly as I could towards the next valley, hoping to reach it before dark, but I was not successful in doing so, the distance being much greater than I had estimated. In the clear and dry atmosphere of Tibet it is, even after much practice, very hard to judge distances with any pretension to accuracy; objects that appear to be, say, only a few miles away are really 8 to 12 miles distant. By the time the adjoining valley was reached, it was far too dark to see if there were any tracks of the caravan, so I thought of resting for a few hours until the moon had risen; but, although partially sheltered from the wind by lying down in a small watercourse, this idea had to be abandoned owing to the cold, which compelled me to keep moving on. After several hours of anxious marching, varied by occasionally firing off my rifle in the hopes of attracting the attention of some of the caravan, and by continually stumbling over stones, etc., the upper part of the valley was reached, and after a short time the moon had risen sufficiently to enable me to definitely ascertain that the caravan had not ascended the valley. I now recognized that the odds against my getting anything to eat till after daybreak, at the very earliest, were very large; so I tightened my belt, took a few sips of muddy water from my three-parts empty water-bottle, and sallied off to find a short cut back to the spot I had started from, in search of the caravan. Very probably the route on my return was shorter, but several nullahs and watercourses had to be crossed, as well as a couple of steep ridges covered with rocks, over which I continually stumbled. Rest for more than a few minutes at a time was out of the question, as the cold wind soon chilled me so much that, in order to avoid being frostbitten, it was absolutely necessary to keep moving. Fortunately, it was a fine clear night, and with the help of the stars—for I never carried a compass, fearing that the chronometer

watches would be affected by it—I guided myself back to the place I wanted to reach by daybreak. From this spot, which is on comparatively high ground, the very faint smoke from the camp fire was seen very far away in the main valley, so I dragged my weary limbs towards it, and in a couple of hours was met by Pike, who came out provided with meat, biscuits, and last, but not least, rum and water, all of which were greatly appreciated. The minimum thermometer at camp registered 10° of frost, while I was wandering about on an empty stomach, with fewer clothes than usual, owing to our having entered a lower and warmer part of the country, so the discomforts of the situation were fully felt.

Not very far from camp 36, or "lost camp," we came across some rather extensive diggings, where probably gold had been found. Two days after leaving this camp, the river whose course we were following had completely sunk into the ground, and as there was not a trace of water to be seen further on, we had to halt while Pike made a long reconnaissance and spotted a very small spring, to which a move was made the next day after interviewing a native. This man professed to be in search of some of his ponies that had strayed, but it is most probable that he had been sent out from Gerge, which is not far distant, to search for us, as no doubt they had been warned of our presence by the nomads recently met. By the aid of the information extracted from this man, we found our way to Gerge, where there are a few tents, with many more in the various side valleys. Some hours after our arrival, a man, who said he was the servant of the headman of the place, nominally came to ascertain who we were and all about our intentions, but really to find out the size of our caravan. Owing to wild statements about us having been sent to Lhasa from Leh, some time before our departure, strict orders were sent every fortnight from Lhasa warning the people to be on the look-out for about 20 British officers and 3000 soldiers, who were invading Tibet from Ladak, to promptly turn them back, and report to Lhasa. In consequence of these orders, men had been sent out to search for us on the known routes, but we escaped this delicate attention by finding a way for ourselves. Some of the visitors to our camp were much surprised at the smallness of our force, but when they were informed by one of the caravan-men that countless soldiers were packed away in the yak dans and baggage, they seemed to consider the explanation quite satisfactory. When the headman of the scattered encampments, all of which are included in Gerge, came to see us, we endeavoured to get fresh transport and more supplies, but found that this could not be done without an order from the Rudok authorities. Feeling quite sure that no assistance would be obtained from that quarter, and as it was useless to wait there any longer, we gave notice of our intention to go on without it, which rather startled the headman, as he was evidently not accustomed to

having any one not conform with his orders. The messenger who announced our intention to this petty official returned with a request that we should halt for a few days longer, when he would endeavour to furnish sufficient supplies until a reply was received, probably in five or six days, from some higher official not so far distant as Rudok. This request was coupled with the intimation from the headman that our advance could only be made over the dead bodies of himself and all the Gerge people, who considered being killed by us quite as good as being executed in Lhasa for allowing us to proceed. Even talking of fighting was too much for our cowardly caravan-men, Argoons, who soon let it be known that we need not rely on them to fight in case of a row. As no signs of any instalments of supplies promised to us for waiting were visible within the appointed time, and as constant reinforcements were being received by the enemy, we settled to leave Gerge and try to strike a road, which S—— D—— had heard of from a Kulu merchant who was buying wool and gold here, leading towards a place called Kangri, where there is said to be a large bazaar during the autumn. Both Pike and I fully expected a row, so plenty of ammunition was issued to our six armed men, in hopes that they would at least loose off their weapons in the direction of the enemy, and not in ours; strict orders were issued to maintain a slow pace, admitting of the sheep marching with the ponies and mules, thus keeping the caravan in close order. To have started in an easterly direction would have certainly ensured a row, so we at first went about south-west, in the direction the Kulu trader had pointed out as being an alternative route to Kangri. Unfortunately, the information about this route proved to be false. The large crowd of Tibetans, all well mounted and armed with muzzle-loading guns, some with swords as well, who had watched us carefully, knowing that there is no other route in the direction we took except to Ladak, allowed us to depart in peace, much to our surprise, ignorant as we were at the time of the reason, for it was not till we had travelled several miles that we found out we had got false news about the road.

In the main valley (Dalung (?)) grass and fuel were scarce, and the water was of very inferior quality, but in the numerous side valleys grass is said to be plentiful. On the south side of the valley the range of high mountains, very few of which are covered with snow, appears to block the way until close to camp 45, where there is a road leading to Thok yalung, Kangri, and Rudok. Finding it hopeless to obtain any more transport, or procure barley, which was much needed, unless we promised to go to Ladak by the route which would be shown to us, and as the caravan-drivers were by this time too much afraid to go in any other direction except that which the Tibetans wished us to follow, we were compelled to submit to their terms. Besides these factors in the case, there were two others equally important: many of our animals were covered with sores, and all of them were in

far too weak and deplorable a condition for us to think of attempting forced marches in an inhabited country where further progress could very easily be effectively stopped, without the slightest risk to the Tibetans, by their driving away our animals while grazing at night. There was now nothing else to be done but to agree to return to Ladak by the route along which we should be guided. As soon as some very ancient ponies had been purchased at high prices, and sufficient transport obtained locally, we began our return march to Ladak, relieved, at least temporarily, of the anxiety about finding grass and water at the end of every march, as two guides were provided. Up to this point we had found our own way for the last three months over about 460

GLACIER NEAR NABO LA PASS.

miles of, to us, unknown country. Now that there was an opportunity of relieving from loads the animals that were in a very bad way from sores and galls, I commenced to wash and dress the wounds, many of which were far too bad to describe. Although this was done on every possible occasion—not by the caravan-men, whom I could not trust to do the unpleasant work satisfactorily—only one of the animals with sore backs, and that a very slight one, lived to reach Ladak.

The Tibetans evidently feared that we would endeavour to go straight to Rudok, and, no doubt with the intention of preventing us from doing so, led us up a very narrow valley on the north side of the main one, most of which was said to be called Dalung, and accompanied us in

large numbers for five marches, the excuse for taking us by this long route being that if the direct route was followed several high passes would have to be crossed. This proved very fortunate, as the sub-surveyor was thus enabled to sketch the country between the outward and homeward routes. In order to make certain of the guides following this route, which towards the end they were not at all well acquainted with, we expressed great eagerness to go direct to Rudok, and it was only after we had been repeatedly informed that numerous high passes had to be negotiated that we ceased to express any desire to deviate from the line our guides were instructed to show us. I do not know what the Tibetans' idea of high passes may be, but as the height of one we crossed is 18,880 feet, we rejoiced at not having been obliged to attempt those which were said to be very high.

The country for the next few marches was much closer than that which we had previously been travelling in. Water was exceedingly scarce, and, except for our having guides who knew the country not far distant from Lima Ringmo Chaka, it would have been almost impossible to find our own way. For five marches the small springs were almost impossible for any one not thoroughly acquainted with the country to locate, and grass was very scarce, so that our wretched ponies and mules suffered considerably. Besides the scarcity of grass, another matter which caused anxiety was the risk of some of our escort noticing me observing at night, or Leno sketching during the day; but the latter was so well managed that only once were questions asked as to why Leno and the men with him were punished by having to ascend mountains and reach camp after every one else. In order to shelter ourselves from the prevalent strong winds, camp 51 was pitched in a very narrow valley, which rendered the task of measuring bases more troublesome. This, however, was a mere nothing to observing in a very strong and equally cold wind at the hill stations of this camp, when it was necessary for Leno and myself to continually relieve each other, one recording while the other was observing. Even with this division of labour, both of us suffered temporarily from the exposure, but a judicious use of some of the contents of the medicine-chest curtailed the unpleasant effects of the severe weather. Although this camp was only 16,630 feet, nearly all the Ladaki caravan-drivers complained of headaches, etc., which they attributed to the great height, and as they abstained from eating meat until the inconvenience ceased, it was only reasonable to believe their complaints. It is certainly very strange that men who live at heights of between 8000 and 12,000 feet should suffer from the effects of rarefied air when neither Pike nor I, who generally frequent places not much above sea-level, experienced any such symptoms. Owing to the wretched condition of the mules and ponies, and to the scarcity of water, we were obliged to make very short marches. The state of our animals served as an excuse for occasional halts, which were necessary for survey purposes,

to which neither of the guides ever raised the slightest objection; in fact, they several times helped to erect pillars, being quite content with the assertion of the caravan bashi that sahibs do strange things, and that once the all-powerful "hokum" (command) had been given, it was to be obeyed whether its purport was understood or not.

A few days after our Tibetan guard left us, a couple of men arrived with supplies for the guides and with news that two men, who had been wounded near camp 31 by Pike's force, which consisted of only four men all told, had died of their wounds. They also informed us that a large body of chukpas were in our vicinity; whereupon our brave guides, after due consultation amongst themselves, formed up and suggested that we should attack the robbers, whose property was to be divided between them and ourselves. According to their proposition, all the yaks, goats, sheep, guns, and everything else, in fact nine-tenths of the plunder, was to be given to the guides, who would assist the enterprise by remaining in camp, nominally to guard it, while any animals capable of carrying baggage might be retained by us. These creatures seemed quite disappointed when we refused to fall in with their plans, and did not understand that we wished to travel peacefully through the country, and would not attack or punish any one unless we were first attacked or robbed. As soon as friendly relations were established between the guides and our men, who invariably made the former fag for them, every endeavour was made to obtain simultaneously from both men when apart corroboration for the names of places previously visited, as well as the names of camps, etc., on this route. One of the guides proved to be a great acquisition in many ways, and seemed to be most anxious to serve us in every way, so a much greater value was placed on his replies, most of which were, I am strongly inclined to believe, fairly true. As a rule, neither Pike nor I were ever present when the names of places, etc., were asked, as we considered that the Tibetan would be far more likely to tell our Ladakis the true names when neither of us was within hearing. When possible corroboration was sought for names, and when this was not to be had, the replies of whoever had confirmed the statements *re* custom, taxes, etc., of men previously questioned, or who did not appear to have anything to gain by telling lies, were accepted. Though every endeavour to ascertain the real names of places was made, I do not wish to assert that all the names given in my map are correct. Wellby calls the pass, which is designated Napo La on my map, Napula, and the lake on the west side of it, called Dyap Cho by me, Lake Treb, and as it is well known that Tibetans generally give travellers erroneous names for places, I fail to see any reason why the names Napo La and Dyap Cho should be considered more correct than those given to Wellby.

One of the hardest parts of the surveying during this journey was

undoubtedly the ascent to the very high hill station south of camp 57. The exceedingly steep mountain-side was covered with very loose shale, necessitating a great amount of energy and determination in order to reach the summit, where the heavy theodolite was eventually brought, and successful observations carried out. Another drawback to observing was the very high wind, which at times necessitated piling large stones round the legs of the theodolite-stand to prevent the instrument being blown over. The rarefied air, combined with a very low temperature, was a constant cause of delay and annoyance when taking astronomical observations at night, as the candles gave very bad light and continually went out, very often fifteen to twenty times each night. The low temperature not only tended to make the candle stick in the holder, but also froze the ink, which could only be used occasionally and when the inkstand was kept in the lantern, the temperature of which was just high enough to keep the ink liquid. Very often the wind disturbed the compass so much that when setting up the theodolite previous to taking astronomical observations to determine the deviation error, which was repeatedly done, it was necessary to shelter the instrument by means of rugs held up by some of the caravan-men until the needle became quite steady. Though many attempts were made to observe occultations, bad luck, in the shape of clouds, continually proved obstructive, and also debarred me from observing transits of the moon and stars culminating near it. Much as I regretted not being able to take lunar observations more frequently, the omission proved to be of no great consequence, as, thanks to the chronometer watches which were kindly lent me by the Royal Geographical Society, and to "travelling rates" having been several times ascertained, good chronometric values for longitude were obtained. By "travelling rates" I mean rates while travelling between places, the difference in longitude of which was determined trigonometrically as we went on. This method of obtaining travelling rates has, I believe, never been used by explorers in unknown and unsurveyed country. Comparatively narrow valleys, with high mountains on either side, and lakes, mostly salt, scattered about, are the main features of this part of Tibet, but scarcity of grass and water are by no means unimportant minor facts worthy of notice. Judging from the well-defined marks near the west end of Keze Chaka, this lake must have been formerly considerably deeper, and its area proportionately larger.

When approaching camp 67 much curiosity and anxiety were experienced about water, as none could be seen, although a good-sized stream was observed close by from a hill near the previous camp, which was a waterless one. This proved to be an intermittent stream which existed for only about six hours daily, its breadth being about 12 feet, and the average depth approximately 9 inches. Owing to the exceedingly porous nature of the soil, we were not able to store up any water

by damming the river, which for the three days we halted appeared and disappeared daily with the greatest regularity. As soon as it was decided to halt for a few days for survey purposes at Chagnagma, or camp 67, one of the guides was sent on with Ramzan, the caravan bashi, to try and locate Rundor, the existence of which we had begun to doubt. They were successful in doing so, and met us on the day we left that almost barren camp, accompanied by a few natives of the long and very sparsely populated valley whose head is at the Napo La, and which is known as Rundor. Ramzan, who was mounted on my riding-pony, procured a guide and went on ahead quickly to Lutkum, from which place he sent back some transport, without which we should not

DIFFICULT PART OF ROUTE THROUGH HUNZA.

have been able to cross the last two passes and halt at two consecutive waterless camps.

Besides the repeated scarcity of grass, many of the springs by which we had to camp were small and so well frozen that often no water was to be had, so that our wretched animals suffered considerably, and at times one or two would not leave the vicinity of camp for a long time after the loads were removed. On one occasion a fine mule, which had lost less condition than any of the others, and which had invariably carried the instruments, would not depart from the close proximity of my tent until driven away, when she speedily returned, until at length she fell down and nearly levelled the tent in doing so. It turned out that the poor brute was suffering

from colic, which made her frequent the camp; but it was certainly very curious that she returned so often to the neighbourhood of the medicine-chest. I was in great hopes that she would survive the journey; but, although the attack of colic did not last long, she succumbed in about a week afterwards to the effects of great cold and semi-starvation. When we reached Rundor, the pombo, or headman, and many of the inhabitants were away in Ladak purchasing supplies, so it was rather hard to obtain transport to convey our baggage over the Napo La, a pass 18,880 feet, over which, although it was free from snow and the approaches comparatively gradual, our impoverished animals were quite unable to carry even small loads, while one had to be shot near the top of the pass. From the broad valley lying west of this pass there is a magnificent panorama of very high mountains, many of which are perpetually covered with snow, and it was here that a serious accident happened to the theodolite. The wind was so strong at my last hill station that, although stones were piled round the lower part of the theodolite-stand, it was blown over by an unusually strong gust, and so damaged that further work was out of the question. This, however, was not of great consequence, as the surveying had been satisfactorily finished, and the instrument was soon repaired at Dehra Dun.

Altogether about 24,000 square miles of country had been surveyed on the side of 8 miles to 1 inch, and the heights of seventy-nine peaks determined. Triangulation was carried on as far as possible, a 6-inch theodolite being used, and a 10-feet subtense bar for measuring bases by; but, owing mainly to my want of previous practice in this class of work, it was not without breaks, when longitudes were checked either chronometrically or by latitudes and azimuths. The heights are barometric, a Collie's portable mercurial barometer being read twice daily, except when I was laid up with fever, and are based on a series of observations at camps the relative heights of which had been determined by triangulation, and were computed differentially from Leh. As a proof of the great accuracy and skill of Leno, it may be stated that his average error in latitude for each camp was only about one-third of a mile. Since crossing the Lanak La, astronomical observations, including numerous ones to determine the deviation of the compass, were taken at all but four camps. Very careful meteorological observations were regularly taken by Pike, who was of the utmost service in every way, especially in reconnoitring, issuing rations, and looking after the natural history and botanical collections. I have not the slightest hesitation in saying that only for the very valuable co-operation and companionship of Arnold Pike, the results of the expedition in every way would have been far smaller, and I feel that I owe a great debt of gratitude to him for having accompanied me. Although topographical work had now been carried on right up to the frontier, the

journey was by no means ended—three high passes and some almost barren camps had to be negotiated before reaching the few houses at Lutkoum.

Of the sixty-six mules and ponies which composed our caravan when it left Leh in May, only six survived to reach Lutkoum in November, and they were only just able to crawl along unladen. Sheep proved to be the best transport animals, very few being unable to carry loads of about 20 lbs., which were subsequently increased after the loss of the ten mules and ponies. After a few days' rest in Leh, I said good-bye to Pike, who wished to remain some time longer in Ladak for shooting, and, setting out for the Zoji La, which was crossed with great difficulty, reached Srinagar on December 10, after walking 600 miles, mostly in Tibet.

Once again Srinagar was the starting-point, and on September 14, 1897, I set out for the Pamirs, *viâ* Gilgit and Hunza, as the Indian Government had very kindly given me permission to use that route, thus enabling me to commence surveying a few days after crossing the frontier, and before any heavy snow had fallen. I was accompanied as far as the Taghdumbash Pamir by R. P. Cobbold, who was so much impressed by the tales of excellent shooting related to us by an American named Isidore Morse, who met us close to the Kilik pass, that he was eager to go direct to Kashgar and apply for permission to shoot in the so-called Eldorado of sportsmen in Russian territory. My party consisted of a sub-surveyor and an orderly, both of whom were kindly lent to me by the Indian Government, a cook, a native collector, and six Argoons headed by Abdul Khalik, who was soon proved to be one of the greatest scoundrels and robbers in Central Asia.

Owing to the demand for ponies for the Tirah Field Force, it was very difficult to obtain suitable animals in Srinagar, but this difficulty was removed by Major Yeilding, D.S.O., C.I.E., who rendered me very valuable assistance by hiring some ponies to go as far as the frontier, and in addition twelve mules in charge of four Pathans, who met me at Gilgit. The Pathans stuck to me for six months, and proved such hard-working and faithful fellows, that I parted from them with the very greatest regret. The miserable cowardly liars who came with the ponies from Astor continually gave plenty of trouble, and although they were most anxious, in Srinagar, to be engaged for six months, they refused for some time to go beyond Hunza, until the matter was reported to Captain McMahon, C.I.E., C.S.I., political agent, Gilgit, who soon arranged matters very satisfactorily. The smallness of my own caravan was a source of much unfavourable comment on the part of Abdul Khalik, the caravan bashi, against whom I had soon accumulated sufficient evidence to convict him, while he swaggeringly informed the rest of the caravan-men and others that I was a poor sort of sahib who bought everything

himself, and who had very few animals of his own, and that he could not make anything out of me, whereas from other sahibs he had pocketed large sums daily. This was speedily reported to me, and in a short time afterwards he was, greatly to his surprise, arrested at Gilgit, where, after a very tedious and impartial trial by the wazir, or native governor, who utterly ignored the threats to murder me which Khalik made in court, he was sentenced to a year's imprisonment for robbing me. This sentence was afterwards commuted considerably, much to my disgust, as it was well known that he had robbed other Europeans and innumerable natives in the sahibs' name; but then, some native states are by no means hostile to men who would soon be turned out of India. While marching from Srinagar to Gilgit, my orderly, Abdul Karim, of the 3rd Madras Lancers, in answer to my query as to his opinion of the caravan bashi, said, "Sahib, he is a very bad man and a robber; kill him, and then there will not be any more trouble." As I did not at once concur with him, he added, "If you do not like to kill him, give me the order, and I will do so at once, then all the trouble will be over." Not wishing to utterly damp my orderly's spirits, I partially contented him by stating that I would make arrangements for the cessation of the trouble in a quieter way.

After a few days' stay in Gilgit, where we were most hospitably received by Captain and Mrs. McMahon, we continued our journey, escorted by the former and the genial and very good natured agency surgeon, Captain Roberts, I.M.S., who most kindly acted as cicerone during the march to Baltit. Captain MacMahon was most anxious for us to postpone our departure from the charming Hunza valley until he could accompany us as far as the Kilik pass, whither he was going on tour; but it was now so late in the season that we were reluctantly obliged to deny ourselves this pleasure, and hasten on in hopes of reaching the Taghdumbash Pamir before any heavy fall of snow had rendered the passes more difficult. On October 22 I commenced work in the west end of the Taghdumbash Pamir, and obtained a good value for my longitude by triangulation, as well as by latitudes and azimuths to some peaks fixed by the Survey of India, but not before my hands were frost-bitten at the highest hill station, which is about 16,000 feet. After spending some days trying to shoot some *Ovis poli*, I moved to Ujadbai and Mazar Sultan, where a halt was made for some days while fresh values for the longitude of my starting-point of mapping were obtained, as I was not quite satisfied with the previous ones. The task of identifying peaks from positions the longitudes of which were not accurately known was rendered still more difficult by being unable to go to a sufficiently high altitude, whence the more prominent peaks could be easily discerned. Deep snow on the higher mountains necessitated lower sites being selected for the hill stations, but even on these the strong biting cold wind was a serious hindrance, not to say discomfort, to surveying

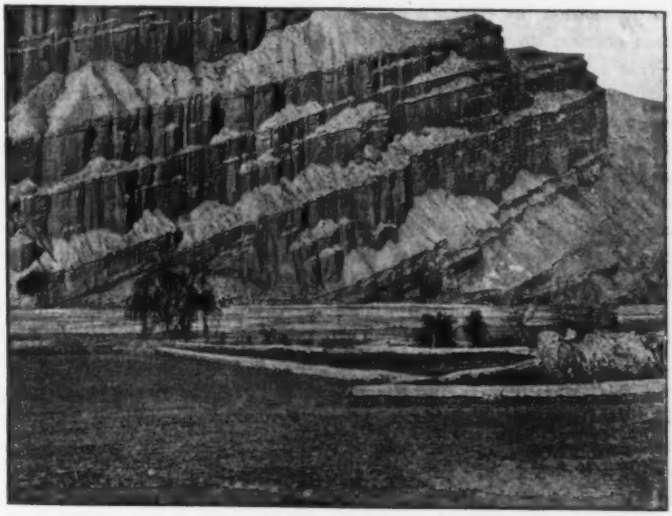
at the altitude of 16,000 feet in the month of November. Several of the peaks which had been previously fixed by the Survey of India, and which I was anxious to observe, were not very prominent ones, and from my observing-stations appeared to be so close to peaks of similar height that the slightest movement of the ruler on the plane-table aligned them on to other peaks, thus adding great doubt and uncertainty to some of the observations. In order to be sure of obtaining satisfactory results, I four or five times went up to the highest hill station near Mazar Sultan, and, when feasible, camped the previous night close to the foot of the mountain, so that by starting a couple of hours before day-break work might be commenced soon after sunrise, and, if possible,

SCENE IN RASKAM.

completed before the strong wind, always trying to the temper, had sprung up. The instruments were carried up the steep mountain-side, which was covered with loose shale and large stones, on a yak, and two more of these most useful and exceptionally hardy and sure-footed beasts transported the sub-surveyor and myself, until the gradient became so steep that it was infinitely preferable to crawl up by hanging on to the yaks' tails than to endeavour to remain in the saddles, which continually slipped back. Much as the ascents were disliked by some, if not all of us, I have no doubt that the yaks resented their being employed in this way, and as a rule required much force, sometimes applied in the shape of a stirrup-iron until it became bent, to make them continue the ascent

even at a very slow pace. However, the results proved satisfactory, as the greatest difference between any two of the three values for the longitude of this starting-point was only some seconds, and the height of Muz Tagh Ata (father of ice mountains) was only about 20 feet less than the two values obtained in the next year from the Wacha or Uchi valley. It was during this halt at Mazar Sultan that obstruction from the natives was first experienced. They tried hard to dissuade me from travelling to the valley of the Yarkand river by stating that the roads had become, and still were, quite impassable, owing to earthquakes, that no guides were obtainable, and that nobody would supply me transport to go there. After some delay, one man, who owned to having formerly known the route to the west end of Raskam, was discovered and induced to accompany one of my men as far as the Raskam or Yarkand river, in order to see how much of the information already obtained was true. While these two went reconnoitring, I moved camp to Oprang, and sent another man accompanied by a native from there to report on another route to the Yarkand river. The native who accompanied my man Islam assured him that there was no route *via* the Oprang pass, and did his best to dissuade him from going; but Islam obeyed the strict orders received from me, and reported the route to be quite easy. Cobbold, who had reached Oprang before me, sent back word that it was only about 10 miles from my camp at Mazar Sultan; but his estimate proved to be so much below the actual distance, that I did not reach his camp till after eight o'clock at night, while one of my men, who declined to be guided, was rewarded for the exalted opinion he had of his own power of guiding himself to a place whose whereabouts he did not know, by spending the night in the open—a far from delightful experience, as the thermometer fell near zero before morning. At length, the headmen, seeing that I was determined to go to the Yarkand river, arranged for transport, and no doubt issued orders to the men who accompanied it that they were to feign ignorance of the route, as was undoubtedly done. I was for some time inclined to attribute these difficulties to the stay-at-home propensities of the Tajiks, but I subsequently ascertained that strict orders had been sent from Kashgar to the Amban of Tashkurghan to warn the people that no attention was to be paid to the public orders issued on my behalf, and that they were to do their best to prevent me from going to the Yarkand river, but that if I proved obstinate and really meant to go there, then transport was to be provided, but no guides on any account. Curious to relate, two shocks of earthquake were felt the night before crossing the Ilisu pass, into what may be called forbidden ground, whereupon I was greeted with the proverbial "I told you so." It was with rather a considerable amount of surprise that those who thought fit to remind me of their previous statements departed from my tent on being told that they were annoying me exceedingly by preventing me from going to sleep.

The descent from the top of the Ilisu pass towards the Yarkand river is fairly gradual, and a great contrast to the steep and rocky ascent from the north. Unfortunately, the route lay along the bottom of the valley of the Talde Kol Su, which was now frozen hard in the upper part of its course, necessitating the frequent use of pickaxes to roughen the ice, and to improve the track where it was impracticable to closely follow the river, while lower down the jungle was so dense that baggage animals were much impeded, and one of them lost an eye. Finding no suitable camping-ground at the mouth of the Talde Kol Su, we ascended the Yarkand river to Sarok Kamish (? Tugrok), and halted there while I followed the well-marked track which crosses the Topa Dawan and



PECULIAR FORMATION IN ASGAN SAL VALLEY.

leads in the direction in which I desired to go. None of the Tajiks who accompanied me from the Taghdumbash Pamir would agree to accompany me along this track, and as I was dependent on them, it was necessary to ascend the Yarkand river to Bazar Dara, where a messenger was sent to arrange for fresh transport. The mountains on the left bank of the river near Sarok Kamish being far too steep to think of getting any instruments carried up them, I was forced to content myself with those on the opposite bank, which are too low to afford a view of any of the peaks fixed from near Mazar Sultan, thus increasing the difficulties of surveying. The only untoward incident of the march through Raskam was the loss of one pony, which stumbled on a very

bad part of the track and fell on to the rock below, where his load was completely smashed up. Although the river was then very low, the fording of it was not easy for laden animals, and between Surukwat and Bazar Dara the difficulty was increased by the thick slippery ice, which extended for several yards from each bank. Here the very necessary pickaxes were in constant use, as passages through this ice had to be cut before the caravan could proceed with any degree of safety. In the march to Bazar Dara the river has to be repeatedly crossed, and as it was frozen over in only two or three places the march occupied a very long time. When close to this place, which consists of a small fort with a nominal garrison of twenty Kirghiz and a petty Chinese official, I was greatly amused by Raju, my caravan bashi, strongly protesting against my riding a nearly barebacked pony which I had caught when grazing, on the score that it would be most unseemly for me not to ride my own well-saddled pony when entering Bazar Dara. Owing to the exceedingly high mountains which hem in Bazar Dara at the mouth of the Dozok Dara Su, the task of measuring a base was very difficult, and reaching the sites selected for hill stations proved to be no light one, especially for the men with the yak carrying the instruments. On previous occasions I was struck by the wonderful agility and surefootedness of the yak, but I was fairly astonished by the way this particular beast got along over ground where the two Kirghiz, who accompanied him, experienced great difficulty.

From Bazar Dara the route lay along the bottom of the exceedingly narrow valley called Dozok Dara, with vertical rock towering above it in many places to a considerable height. The approach to the Kukalung pass was very trying to mules and ponies, the former being undoubtedly by far the worst when marching up the very slippery and sloping ice, which for some distance completely filled the bottom of the narrow valley we had to ascend. The actual pass, though over 16,000 feet, is quite easy when there is no snow or ice on the north side, where the descent for some hundreds of feet is very steep. After a day's rest at Zad, the largest Kirghiz settlement in the Kulan Urgi valley, I managed to hire a few yaks, and started to recross the Kukalung pass, determined to carry the triangulation across it to Zad. On account of the great cold—the minimum thermometer fell to – 12° Fahr. on the night of December 14—and the almost total absence of grass where it was necessary to halt on the south side of the pass, yaks were the only animals who could stand the double journey. These useful beasts can easily go for a few days with little or nothing to eat, and their thick coats protect them from the severity of the weather. On my return to camp 24, after a long and hard day's work on the high ground, where there was a fairly strong wind and the thermometer about zero, my beard and moustache were covered with icicles, which had to be melted in front of a small fire of dung and boortza. Feeling doubtful about being

able to identify from Zad the peaks observed at camps 19 and 21, I decided to spend a night close to the summit of the Kukalung pass and devote the next day, Christmas Eve, to measuring a base, etc., at the altitude of about 16,000 feet. Fortunately, we had brought a couple of sacks of dung and boortza to this barren and waterless spot, as the supply of fuel ordered from Zad was never sent.

It is exceedingly hard to state truly which was the worst day devoted to surveying on this journey, but it may be confidently stated that Christmas Eve, 1897, was quite one of if not the worst. The first item of that day's work was to climb up about 1000 feet to a site which commanded an extensive view, and spend a long time in the usual wind, with the thermometer below zero. As soon as the theodolite was packed up, the yak loaded, and a large pillar erected to mark the site, the descent to the other station was begun. Bad as the ascent was, the descent was far worse, the shale being more slippery and the gradient steeper. Owing to dearth of fuel, etc., it was imperative to complete the work at this camp in one day, the consequence being that I did not reach camp in the valley of the Kulan Urgi till about nine o'clock at night, and the men with the yaks much later.

At Zad more triangulation was done, and a last attempt was made two marches further on, but it was now too late in the season to permit of ascending to a suitable height whence the high barren mountains lying between me and the Yarkand river could be plainly seen, so recourse had to be made to observations of moon culminating stars for longitude. Bad weather put a stop to this, and the illness of the sub-surveyor, Dalbir Rai, to further topographical work, so a move was made to Yarkand. From Issok Bulok Agzee, or camp 26, onwards to the Yarkand river, the Kulan Urgi valley is exceedingly narrow, and bounded by precipitous mountains of considerable height. From Tir, a small village a few miles from where the Kulan Urgi river joins the Yarkand river, there is the choice of two routes of about equal length to Yarkand. That leading over the Sandal Dawan being reported less difficult than that over the Kuramut Dawan, I settled to travel by the former. The usual frozen river often proved very difficult for the baggage animals, but the main obstacle was encountered in a spot where the only possible way of getting the animals on was by hauling them up two steep drops of solid rock, where none but men, goats, and mountain sheep could ascend without assistance. A narrow ledge of rock halfway between the very steep parts enabled men and animals to rest before reaching the summit. Many of the animals were got up without much difficulty, but some proved very troublesome, and it was only with very great difficulty and hard work on the part of numerous men that the refractory ones were hauled up without turning somersaults. Needless to say, all the baggage had to be brought up by men, which added considerably to the delay.

About halfway between this obstruction and the summit there is another spot impracticable for laden mules and ponies. As to this fact we had not been enlightened by the Uz Bashi, or headman, of Tir, who returned to his village together with all the other men who assisted in getting the caravan up the rocks, thus leaving us in the lurch. This delayed the march considerably, as there were no extra men to assist, but the descent on the other side of the pass taxed the caravan-men and their charges severely. The gradient is very steep, and a recent slight fall of snow had so covered the rocks, stones, and shale that no track could be discerned, so we had to find our own way down. Men and animals continually fell down, especially at the foot of the very steep part where the narrow valley was for some distance a mass of sloping and slippery ice, on which they had to travel as best they could. We had hoped to reach some inhabited place before dark, but the difficulties of the march necessitated bivouacking on the mountain-side, where there was fortunately sufficient grass and a fair amount of partially dry yak-dung, the only available fuel. The old Pathan, Mohammed Amin, and his section of the caravan did not reach this inhospitable spot till after nine o'clock, having left all the baggage higher up. Wonderful to relate, the barometer, which was carried by one of the Pathans, survived this day's most trying march. The next day dysentery attacked Dalbir Rai, the sub-surveyor, and as little or no milk was obtainable, it was necessary to have him carried to Yarkand, where we arrived on January 20. Almost as soon as he recovered from this attack, rheumatism attacked him in a mild form, no doubt the result of exposure in the mountains. The latter also had its effect on me, and aided by a Chinese dinner which the Amban of Yarkand invited me to, and which was served in an open courtyard with a temperature considerably below freezing-point, proved too much for my constitution, which is not seasoned to a meal consisting of more than twenty-five dishes, washed down by the most evil-smelling hot and raw spirit that my nasal organ has ever been near.

(*To be continued.*)

THROUGH AFRICA FROM THE CAPE TO CAIRO.*

By EWART S. GROGAN.

THERE is a saying in South Africa that "every one who has once drunk dop (a brandy made in the Cape) and smoked Transvaal tobacco will, in spite of all inducements to the contrary, in spite of all the abominable discomforts inseparable from life in Africa, continually return to the old free untrammelled life of the veldt."

Anything more ridiculous than the possibility of my return to

* Read at the Royal Geographical Society, April 30, 1900. Map, p. 264.

Africa never occurred to me as I wearily munched my ration of everlasting bully beef and rice during the Matabele war of '96, and, after three weeks of dysentery and an attack of hæmaglobinuric fever, I shook my fist at Beira from a homeward-bound steamer, happy in the thought that never again should I set eyes on those accursed sands. Thirteen months later I stood on those same sands with my friend Mr. Sharp, having made up our minds to explore the little-known country between Tanganyika and Ruwenzori, and, if possible, to continue our journey down the Nile. Wars and rumours of wars in many of the countries to be traversed, and Khartum in the clutch of the Khalifa, rendered the success of our enterprise extremely problematical; and as failure is unpardonable, we wisely refrained from announcing our intentions.

From the Cape to the Zambezi is perhaps better known to most English people than many parts of England, and consequently I will pass over this stage, confining myself to a very few remarks on the Gorongoza country of Portuguese East Africa.

The river Pungwe, as every one knows, flows into the channel of Mozambique, forming with the river Busi the extensive bay on which Beira, the port of Rhodesia, is situated. Thirty-six miles in a straight line from Beira the railway crosses the Pungwe to a spot called Fontesvilla, on the right bank. Four miles above this the Pungwe flows in two channels; the left, which is the larger, is called the Dingi Dingi, the enclosed island being about 40 miles by 6. Twenty miles above the lower junction an important tributary called the Urema flows into the Dingi Dingi, bringing down the drainage of the east and north-east slopes of Gorongoza's hills and the drainage of the vast swampy Gorongoza plain; consequently, even in the dry season the Urema has a considerable body of water. Its main feeders are a wide sandy river from the east, and a smaller stream called the Manza, also from the east, and the Umkulumadzi, which brings the main volume of water from Gorongoza's hills on the west. Between the Dingi Dingi and the Urema there is a triangular patch of forest, with a network of deep water-troughs; these, even in Mr. Mahony's time (Mr. Mahony has been in this country for about nine years), were lagoons with much water, and the natives went from village to village in canoes. Now, with the exception of a few deep water-holes, they are dry, the canoes may still be seen rotting on the dry bed, and the crocodiles, the few that have survived, lead a precarious existence in the moist grass that grows along some of the deeper channels. This, coupled with the fact that the swamps a few miles to the north are visibly diminishing, proves that even in this district, remote as it is from the centre of disturbance, there is a constant and rapid process of upheaval.

The quantity of game in all this country is incredible. Crossing the great plain just as the waters were falling and the new grass growing

up, we saw over 40,000 head of game, mainly blue wildebeeste, from one point; and during our stay of five months, besides many fine heads of buffalo and various species of antelope, we shot seventeen lions and captured alive five cubs, three of which are now disporting themselves in Regent's Park. Another curious point about this country is that the Urema, which was till lately navigable for about 50 miles in small boats, is now totally blocked by a vegetable growth similar to the famous Nile "sudd," but without the papyrus, which, I believe I am correct in saying, is practically confined to the Nile system, though there are a few papyrus swamps round Kivu.

We began our real forward movement when we left the Zambezi in October, 1898; thence we travelled by the Shire river to Chiromo, the port of British Central Africa situated at the junction of the Ruo and Shire. Thence by steamer on the Shire to Katunga, whence the road leads overland *viâ* Blantyre to Matope, as about 120 miles of rapids render the river unnavigable. From Matope to Karonga, at the north end of Nyasa, there is an uninterrupted waterway of about 500 miles. Thus far is merely a question of taking a first-class ticket with one of the rival transport companies, of which the African Flotilla Company, despite the heavy handicap of being late in the field, is rapidly forging to the front.

From Chiromo, where I had to wait for some loads that had gone to Delagoa bay by mistake, I crossed the Ruo and spent some time in exploring the mountain mass of Chiperoni, while Sharp hurried on to Karonga to arrange transport to Tanganyika.

Chiperoni, which had previously, I believe, only been visited by Messrs. Harrison and Kirby, the well-known big game hunters, is 6000 feet high, and a conspicuous landmark for many miles round. The main peak, with a broad terrace 500 feet from the summit, is situated in the east side of a huge basin formed by surrounding peaks, the chief of which is Makumbi on the north-west; the bottom of the basin is a forest-clad plateau about 2000 feet above the surrounding plains. The mass is drained by the Ruo, Liadzi, Zitembi, Machinjiri, and Misongwe, all of which flow into the Shire. The inhabitants, who have a supreme contempt for the Portuguese, their nominal masters, are a branch of the Wakunda, and are possessed of domestic swine and pigeons, and they cultivate the pineapple and rice, besides the ordinary grains of the country, millet and maize. They suffer much from goitre, and I observed many albinos. The results of inbreeding, inevitable from the isolation of families in mountainous countries, such as leprosy and other diseases, are very noticeable.

On arrival at Karonga I found that Sharp had left for Ujiji, to obtain dhows on Tanganyika. After a fortnight's delay in obtaining porters, I followed along the Stevenson road. The march to Kituta, at the south end of Tanganyika, is most uninteresting; however, I broke the

monotony by a short trip with Mr. Palmer, the assistant collector at Mambwe, to the Chambezi, which is the real source of the Congo. This district has been recently thoroughly explored by Mr. Wallis, who laid the results of his experience before this Society. But there was still a portion unknown, the vast swamp that lies at the junction of the Chambezi and its main feeder the Chosi, known to the natives as Luwala. It is a triangular patch of territory of about 1500 square miles, and quite uninhabited, a few natives only coming to fish as the waters recede after the rains. Unfortunately, the rains had broken, and we were prevented from penetrating far into the interior by the depth of water. All the streams that flow south-east from the plateau and fall

THE VOLCANOES FROM LAKE KIVU; VIEW FROM SOUTH-EAST.

into the Luwala, mingle and lose themselves in the swamp, and eventually drain out by the Mwenda.

From Kituta I went to Mtowa, the chief station of the Congo Free State on Tanganyika, by the small steamer belonging to the African Lakes Corporation, while I sent my boys and the loads to Ujiji on a dhow that Sharp had sent down. On arrival at Mtowa I found Sharp more dead than alive with fever, in the care of the late Dr. Castellote, the medical officer of Mr. Mohun's telegraph expedition, who had rescued him from Ujiji, where he had been very ill. Two days later we crossed to Ujiji, and after a few days of the lavish hospitality of Hauptmann Bethe and his colleagues, we collected our safari of 130 Manyema carriers and started up the lake by land. Sharp got a slight sunstroke, and my fever became so bad that we arrived at Usambara more dead

than alive. However, Lieut. von Gravert obtained cattle for us, and a team of boys to carry me in a machila to the highlands of Kivu.

The Rusisi, which flows out of Kivu, empties its water into Tanganyika through five mouths, four of which are close together, while the fifth is close to the north-west corner. The enclosed deltas are very swampy and partly covered by tropical forest, and are said to be the feeding-grounds of numerous elephants, a large proportion of which are reported as tuskless. The northern end of Tanganyika is very shallow; we saw hippopotami walking on the bottom at a distance of at least 2 miles from the shore. The lower end of the Rusisi valley for a distance of 20 miles has risen quite recently, geologically speaking, deposits of shells in a semi-fossilized state being visible on all sides. The valley rises very gradually till 20 miles south of Kivu, when the increase in altitude is very abrupt; though this might be manœuvred, for railway purposes, by making use of the winding valley to the east. The Rusisi itself has cut a channel through the hills on the west in a succession of rapids and cascades. There are signs of the above-mentioned eastern valley having been the old bed of the river. Immense walls of mountains shut the valley in on either side, walls that continue practically unbroken to the outflow of the Nile from the Albert lake. The Germans have cleverly availed themselves of the opportunity afforded by the five years' chaos on the Belgian frontier. They have pushed three posts forward, two on the river itself, and the third on the south point of Lake Kivu. The latter is at least 40 miles over the treaty boundary. With the thoroughness characteristic of German undertakings, they have despatched Dr. Kandt to investigate the possibilities of the country.

The tail of Kivu is a network of islands, which culminate towards the north in the large island of Kwijwi. The coast-line must be something enormous, rivalling, I imagine, the coast-line of any other water in the world of the same extent. On the east coast two long arms run for several miles inland, and thousands of winding lochs radiate in every direction, dotted with islets and broken up into countless little bays and creeks. The lake is very deep, and contains neither crocodiles nor hippopotamus; this also applies to all the small lakes and rivers in this neighbourhood; but there are enormous numbers of large otters, and the typical bird is the demoiselle crane. Numerous fish resembling a carp are caught and cured by the natives; but there appeared to be no large fish such as are found in Tanganyika. The whole surrounding country is packed with small hills, which appear to have been sprinkled on with a pepper-pot till not a single one more could find room. The majority of them are not connected with ridges of any sort, consequently it is necessary to perpetually ascend and descend; and the valleys, which are very narrow, are often filled with papyrus swamps. The hills are covered with magnificent pasture, which affords grazing

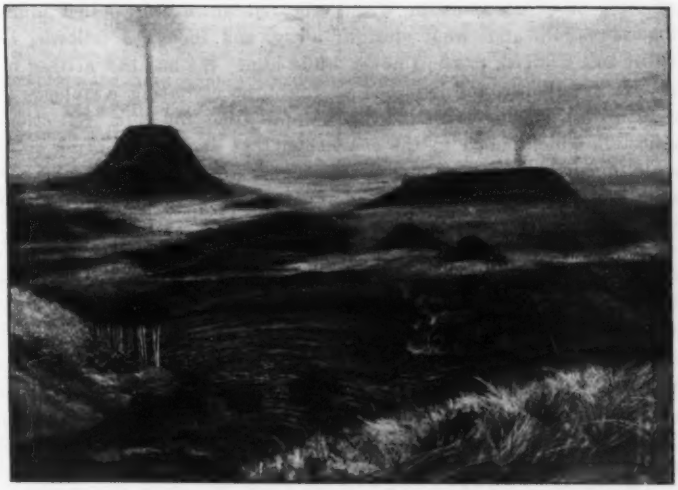
for the large herds of cattle owned by the Watusi. The people are known collectively as the Waruanda, and society is divided into two classes. The Watusi, who are similar to, if not identical with, the Wahuma, are the aristocrats. They are presumably descendants of the great wave of invasion of Gallas that penetrated in remote ages as far as Tanganyika; they are a purely pastoral folk, breeding a long-horned cattle, with which they live, preferring slavery even to separation from their beloved beasts. Two to a hundred of these gentlemen are to be found in every village; they do no work beyond milking and butter-making, and when in need of tobacco, grain, or other necessaries, quietly relieve the aborigines of the country, whom they call Wahutu, of what they require. The Wahutu are abjectly servile to the Watusi, but presumably, from the satisfaction that we gave to the inhabitants by a slight difference of opinion that we had with Ngenzi, the satrap of Mukinyaga, not totally in accord with their taskmasters. In the time of the late king of Ruanda there was a very formidable and far-reaching feudal system, the provinces being administered by satraps (native name ntwala), who were directly responsible to the kigeri, or king, each village being in itself governed by an mtusi (sultani), who was responsible to his ntwala. All the cattle belongs to the king absolutely, but was held in trust by his satraps, who again parcelled it out among the minor Watusi. The Wahutu appear to be merely hewers of wood and drawers of water, and to be allowed as a favour to assist in the herding of the goats and cattle. A few months before our visit the old king had died, and the kingdom was divided between his two sons, one of whom had his headquarters at the north-east corner of the lake, while the other lived to the east of the highest of the volcanoes.

The civilizing influence of the northern influx is conspicuous in the terracing of the hills for cultivation, rudimentary efforts at irrigation, enclosing of villages and cultivated lands by hedges, and even in the formation of artificial reservoirs with side troughs for watering cattle. The scenery of Kivu is superb, a happy blend of Scotland, Japan, and the South Sea islands. The track we followed often led over hills 1500 feet above the lake, and from some of our camps we looked down on the vast oily expanse of water deep-set in its basin of innumerable hills, dotted with a thousand isles, stretching far away till it was lost in the shimmering haze of the northern shore, where crisp and clear towered the mighty mass of Kirunga, whose jet of smoke alone broke the steel-blue dome of sky. At the north-east corner of the lake the hills stop, and the country slopes gradually from the lake-level to the base of the volcanoes, broken only by scattered dead volcanic cones still perfect in form. The eastern portion of this plain is densely populated, and grows enormous crops of maize, hungry rice, millet, sweet potatoes, peas, beans, and edible arum, wherever there is an open space between the endless banana plantations. The western portion, which has been

recently covered by a lava-stream, is not yet sufficiently disintegrated for cultivation, though it already supports a heavy bush growth which bursts from every crack and cranny in the lava-blocks.

The main volcanoes are six in number, two of which are active; the other four have long been extinct. Owing to the impossibility of obtaining representative names for them—I obtained as many as thirty-six for the highest in one camp—I have ventured to name the most important to prevent confusion. Of the two western peaks, which are sharply separated from the other four, the higher peak, generally described as Kirunga, I have called Mount Götzen, after Count Götzen, who discovered Kivu and made the ascent of the peak to the main crater, which is still mildly active. The second one, which has formed since Count Götzen's visit, I have called Mount Sharp, after my fellow-traveller, Mr. A. H. Sharp. Count Götzen mentions considerable activity on the far point of the north-western ridge, and, according to the natives, two years before our arrival in the country there had been a terrific eruption, in the course of which the volcano formed; its crater appears to be enormous, and must be several miles in extent. The lava flowed in two main streams towards the north, and there was a minor overflow to the south-west. The largest srream flowed down by the *arête* between Mounts Götzen and Sharp, a small overflow running, as I have mentioned, south-west, while the main volume poured down into the south end of the Ruchuru valley, down which it flowed for a distance of about 30 miles, working close up to and filling the small bays of the eastern terrace. Shortly after another wave followed over the same course, leaving a sharply defined terrace when it cooled. Then there appears to have been a terrific vomiting forth of huge blocks of lava and ash, which in places are piled to a height of 30 feet on the top of the main lava-stream. The forest with which the valley was clothed was entirely engulfed in the stream's course, while the forest on the sides was blown down by the attendant whirlwinds. The natives informed me that whole herds of elephants were destroyed; I myself saw the bones of one that had been forced up to the top by the edge of the stream. As far as I could gather, the eruption had been very sudden, but I found it extremely difficult to obtain much information beyond the fact that suddenly there was darkness as the darkness of night, when all became fire, and terrible and wonderful things happened of which there can be no words! As in all things that the native cannot understand, there was a distinct aversion to talking about it; all my questions met with a similar response, and they rapidly changed the subject. The other main stream which flowed down the north-west slope was of enormous extent, but as I merely crossed it, I had no opportunity of accurately estimating the area covered. Besides a small branch about 400 yards wide, the width at my crossing was about 2 miles, and this was well on the slope of the hill; further down, where

it met the eastern main stream, the width of the two combined cannot have been less than 15 miles. In the plain to the north of Kivu, in the pass between the two blocks of volcanoes, and on the slopes to the north, owing to the porous nature of the ground there is no water; yet in spite of this there is an enormous population, the necessary water being obtained by tapping the stems of the banana palms. The moisture is retained by the ground, and consequently the forests that clothe the slopes of the volcanoes are wildly luxuriant and impenetrable to everything but the elephant. When hunting and following close on the tracks of an elephant, we had to cut our way with a native axe, without which no one moves a yard; for hundreds of yards at a time



THE VOLCANOES MOUNT GÖTZEN AND MOUNT SHARP, FROM THE NORTH-EAST.

one never touched the ground, but was climbing along the prostrate tree-trunks and dense growth, which of course the elephant would take in its stride. More desperate work or more dangerous hunting it would be impossible to conceive.

Although the forests were full of elephants, it was only after a week's terrible work that I found; and then I had to fire at him at 2 yards, as if I stepped back I could no longer see him. It was impossible to creep to either side of him, so impenetrable was the undergrowth, and I had perforce to take the shot as it was, or lose the chance. The effect on the sportsman of firing a double 4-bore at such close quarters can be better imagined than described; as for the elephant, I believe he is still running. The next day I followed up another, and, after

knocking him down three times, was furiously charged, and either kicked or carried by the rush on to some thorn tree 10 feet above the ground, my gun being picked up 10 yards away in the opposite direction, full of blood; I could not see him till his head was right above me, when I pulled off both barrels of the ·500 magnum that I was carrying; this evidently turned him. I was pulled down from my spiky perch by my niggers, who, seeing me drenched with blood, thought I must be dead, till an examination proved that it was the elephant's blood. On resuming the chase, he got my wind again, but, fearing the charge, merely let off some superfluous steam in throwing trees about, a performance that so impressed me, that I have never tackled an elephant with any degree of comfort since. After ten minutes of this exhausting display he fell down, but pulled himself together again and went straight away, and though I followed him till it was too dark to see, I never found him. We had had neither food nor water all day, and it rained all night, necessitating a hungry and chilly vigil, during which I had ample time for calm reflection—reflection which ended in the conclusion that elephant-hunting in the scale of sports might be placed between croquet and marbles. Sharp, after losing two stone in herculean efforts, never even saw one, and gave it up in disgust.

Of the four main peaks of the eastern mass of volcanoes, all of which are extinct, the highest I have described as Mount Eyres, after Mrs. Eyres, of Dumbleton Hall, Evesham, Sharp's sister, without whose help and encouragement we should have failed to bring our trip to a satisfactory conclusion. The other high peak I have described as Mount Kandt, after the distinguished German scientist, who is making a most elaborate study of the whole region. Nearly every morning there was snow on these two peaks, and the height of Mount Eyres must be nearly 13,000 feet (?), as during my elephant-hunting, when I explored all the north-west face, my aneroid registered on one occasion more than 11,000 feet. Leaving the elephant, I made a rapid tour to establish the identity of Mfumbiro, which is conspicuously marked on most maps, with the height added, and I ascertained for certain what I had been led by the Germans to suspect, namely, that Mfumbiro has never existed outside the imagination of the British statesman. Mfumbiro, it will be remembered, was accepted by us from the Germans as a counterpoise to Kilimanjaro, which we gave to them in our usual open-handed manner in the boundary agreement between British East Africa and German East Africa. The forests of these volcanoes are a branch of the great Aruwimi forest, and the home of numbers of pygmies, who hunt the elephant and search for bees, trading the meat and honey with the Waruanda for grain, spear and arrow heads, and knives; while the Waruanda buy their bows and arrows complete, the dwarfs' work being much superior to their own.

When making the circuit of the two active volcanoes, I had an unpleasant experience with a tribe of cannibals called the Baleka, who made what had lately been a delightful and thriving district most undesirably warm. Their superfluous attentions and the absence of food prevented me from exploring two small lakes that I saw to the west, and from determining whether the large stream which I could see issuing from the southern lake flowed into Kivu or down the other side of the watershed direct into one of the tributaries of the Congo. Four days' continual marching, during which I and my ten boys suffered much from hunger, took us out of the country in time to warn Sharp, who was coming round the south of Mount Götzen to meet me with the rest of the caravan. Joining forces again, we returned through the pass once more, and started down the Ruchuru, or, as it is here called, the Kako valley. The Kako rises on the north slopes of the volcanoes, and, becoming further north the Ruchuru, flows into the Albert Edward lake; hence its headwaters are the true source of the Albert Nile. Curiously enough, the source of the Victoria Nile is only 40 miles south of this, the headwaters of the Nyavalongo, which is the main tributary of the Kagera, the main feeder of the Victoria lake, rising a few miles from Kivu. Thus within six days we passed the two actual sources of the Nile, which, rising close together, but flowing in different directions, enclose such a vast tract of country before they finally merge at the north end of the Albert lake preparatory to the long voyage *viâ* Khartum to the Mediterranean. The height of the crest of the pass is 7000 feet, and the ground quickly falls away to the north till one drops to the dead level of the vast Albert Edward plains.

When exploring with a small number of followers, I observed some ape-like creatures leering at me from behind banana palms, and with considerable difficulty my Ruanda guide induced one of them to come and be inspected; he was a tall man, with the long arms, pendant paunch, and short legs of the ape, pronouncedly microcephalous and prognathous. At first he was terribly alarmed, but soon gained confidence, and when I asked him about elephant and other game, he gave me most realistic representations of them and of how they should be attacked. I failed to exactly define their social status, but from the contempt in which they were held by the Waruanda their local caste must be very low. The stamp of the brute was so strong on them that I should place them lower in the human scale than any other natives I have seen in Africa. Their type is totally distinct from the other people's, and, judging from the twenty to thirty specimens I saw, very consistent. Their face, body, and limbs are covered with wiry hair, and the hang of the long powerful arms, the slight stoop of the trunk, and the hunted, vacant expression of the face made up a *tout ensemble* that was a terrible pictorial proof of Darwinism. The pigmies are of

similar build, but have the appearance of full-grown, exceedingly powerful men compressed, and with much more intelligent faces. The pigmies are to these ape-like beings as the dog-faced baboons are to the gorillas. Probably they are, like the pigmies, survivals of former inhabitants of the country, the difference in their type depending on the surroundings in which they have had to struggle for existence. The true type of pigmy is a magnificent example of nature's adaptability, being a combination of immense strength, necessary for the precarious hunting life they lead, and compactness indispensable to rapid movement in dense forest where the pig-runs are the only means of passage. While I was with the main caravan I never saw either a pigmy or one of these creatures, and to study them it is necessary to go almost unattended; this obviously entails great risk, and it is consequently very difficult to find out much about them. They both have the furtive way of looking at you characteristic of the wild animal, and though I had one of these curious men with me for a week when I made the circuit of the volcanoes, he would always start if I looked at him, and he followed my every move with his eyes as would a nervous dog; he refused an offer of cloth for his services, and suddenly vanished into the forest without a word, though several times afterwards I found him watching me even when I had returned to my camp on the base of Mount Eyres.

On the last spur of the volcanoes there is a chief called Kahanga, of some little importance, who has, to a great extent, emancipated himself from the yoke of the Watusi; and further down the Ruchuru valley the people are still more independent, till one comes to a thickly populated area two days from the Albert Edward, where the chiefs deny that they owe any allegiance whatever to the Kigeri. The west side of the valley is covered with heavy forest, while the east side is undulating grass land, till 15 miles from the lake, when the country settles down into one vast plain. The Ruchuru here has become almost too salt to drink, and the vegetation changes abruptly in character, the luxuriant forest growth giving way to thorn scrub and candelabra euphorbia, the beginning of the blighted desolation characteristic of the Albert Nile valley—scrub, mimosa trees, fan palm, and euphorbia alternating till the region of the borassus, which begins at the upper junction of the Bahr-el-Giraffe.

Where the Ruchuru flows into the Albert Edward there is a large extent of reedy marsh, peopled by a race of fishermen who appear to be identical with the curious Wanyabuga, who inhabit the similar country at the entrance of the Semliki into the Albert lake. They are both quite distinct from their neighbours, and are now isolated. I am inclined to think that they too are survivors of past races, who are making a last stand for existence in these impenetrable wastes, where, leading an amphibious life that does not bring them into contact with the

more sturdy races who have supplanted them, they may yet give an important clue to the ethnological problem of Africa. Unfortunately, the difficulty of approaching these timid and retiring peoples, and the thoroughness with which contiguous peoples assimilate the prevailing tongue, the study is one of great difficulty. The lake itself is rapidly diminishing in extent, and it will be seen that our map of the east coast has materially modified the supposed form. Two very recent levels are clearly defined, from which it would appear that the upheaval has taken place in fits and starts. The most recent level would give the lake an additional 120 square miles. The insignificant size of the euphorbia on this level compared with that on the next terrace argues

THE GEYSERS, ALBERT EDWARD NYANZA.

that the last movement has taken place very recently, historically speaking. The vegetation appeared to me to correspond in age to that which I have mentioned as having grown on the great lava-beds poured out by the eruption previous to that of three years ago.

Two streams, the Sasa and the Ntungwe, flow to the Albert Edward east of the Ruchuru, but lose themselves in an extensive marsh. The old lake-bed is rendered impassable by pits of fire, and huge jets of smoke, shooting up from all directions, bear witness to the extent of the volcanic activity. Even to unscientific observers like ourselves, it was evident that the country between Kivu and the Albert Edward is the key to the whole modern geographical and geological problem of Africa,

as probably Ruwenzori is the key to the problem of the past. To summarize: the Rusisi valley for 60 miles is obviously the old lake-bed of Tanganyika. Lake Kivu has been lifted up with the gradual rise centring round and radiating north and south from the volcanoes. The surrounding hills still enclose papyrus swamps at the lake-level, and some of these, having been pushed up by local movement, have become dry lawns.

I can only describe the Kivu region as having the appearance of having bubbled. The north shore of Kivu is flat and slopes gradually up to the volcanoes, sloping down gradually again on the north side, till the dead level of the lower Ruchuru valley is reached—another obvious lake-bed, part of which was drained dry but yesterday. A few small lakelets even are held still on this northern slope, and there are many marshes and lagoons on the dead level. North of Lake Albert Edward we find the old disturbing influence Ruwenzori. But Lake Ruisamba and its surrounding swamps to the east and the Semliki valley to the west carry on the idea. The northern half of the Semliki valley is a dead level with many swamps, and then comes the Albert lake.

The lakelike reach of the Nile, narrowing at the Dufile rapids (another centre of disturbance in remote ages), and again widening till the swamps of the Rohl Bahr-el-Ghazal, Bahr-el-Jebel, and Bahr-el-Zaraf, which can only be adequately described as a reed-grown sea, is a further indication of the probability of an existence of a vast inland sea, or arm of the sea, of which the great African lakes of to-day are but a fragmentary survival.

The east coast of the Albert Edward lake is practically uninhabited; a very few miserable natives live in the dense thickets of thorn bush, and their huts are most carefully concealed. Their staple crop is the sweet potato, and they spear fish and kill an occasional hippopotamus in traps. They complained of having been raided by the people of Ankoli. On arrival at the north end, Kaihura ferried us and all our belongings across the narrow neck of Lake Ruisamba. Their canoes are similar in make to the canoes of the Waganda, but not of such elaborate design, being made of axe-hewn boards sewn together with banana-fibre cord; they are very capacious, and are so well fitted that they leak much less than would be expected from their construction. The Sudanese officer at Katwe entertained us for two days, when, having recovered sufficiently from the severe fever from which I had been suffering, we started for Toro, and six days later arrived at Fort Gerry, the headquarters of the district. There are immense numbers of elephant in Toro, and we went up to the Msisi river, which flows into the south-east corner of Lake Albert, for a fortnight's shooting. Being white men, we had the privilege of paying a £25 licence, which enabled us to shoot two elephant; but our sport was spoilt by bands of Waganda, who had crossed the

frontier and were shooting indiscriminately anything with a trunk, regardless of sex or age. Needless to say they paid nothing. Nothing could be more acceptable than game laws and game preserves intended to restrict the indiscriminate shooting of big game; but before the Government is capable of enforcing them or even of knowing when they are ignored, I think they are premature. Here, to my great regret, Sharp was forced to return home, and I had to continue my journey alone. Thirty of our Manyema volunteered to go on with me as far as Wadelai, and with this reduced caravan I marched by the little volcanic lakes Vijongo and round the northern spur of Ruwenzori to the Semliki valley, which I crossed, climbing up again on to the Congo plateau. Here, on the west side of Mboga, I stayed for three weeks hunting elephant, my best tusks being 98 lbs. and 86 lbs.; these, curiously enough, were obtained the same day from two single-tusked elephants, one being a right tusk and the other a left, and each measured 7 feet 10 inches.

In this country the prevailing type of elephant differed considerably from the Toro and Nile type. Full-grown bulls carrying 70, 80, and 90 lbs. tusks stood no higher than 9 feet at the shoulder; whereas two of the other type I measured were a full 11 feet 6 inches, and several over 11 feet. The ivory was also quite different—the Mboga tusks being long, thin, and almost straight, very white, and free from cracks; as opposed to the curly dull white tusks, covered with small cracks, of the heavier beast. The tusks of the Mboga elephant are set in the skull at a different angle and hang straight down, giving the beast the appearance of having three trunks; while the tusks of the more general type curl out in front almost at right angles.

The Balegga who inhabit the hills to the north, and who were suffering terribly from the effects of the long drought, looked upon me as a great institution, and swarmed down in hundreds for the meat. A weird sight it was. Stark naked savages, with long greased plaits of hair hanging down to their shoulders, were perched on every available inch of the carcase, hacking away with knives and spears, yelling, whooping, wrestling, cursing, and munching, covered with blood and entrails; the new-comers tearing off lumps of meat and swallowing them raw, the earlier arrivals defending great lumps of offal and other delicacies, while others were crawling in and out of the intestines like so many prairie marmots. Old men, young men, prehistoric hags, babies, one and all gorging or gorged, smearing themselves with blood, laughing, and fighting. Pools of blood, strips of hide, vast bones, blocks of meat, individuals who had not dined wisely but too well, lay around in bewildering confusion, and in two short hours all was finished. Nothing remained but the great gaunt ribs like the skeleton of a shipwreck, and a few disconsolate-looking vultures perched thereon.

Returning to the Semliki, I followed the valley down to the Albert

lake, and eventually arrived at the scene of the relief of Emin. Here it was impossible to obtain food; the natives had been raided and shot down by the Congo State soldiers, and had fled to the marshes and reed-beds of the Semliki mouth. After some difficulty, I persuaded them that I was of the same tribe as Colonel Lugard, and being satisfied by the production of his photo, their confidence in me was complete. As this territory is British, the charge against the Belgians is a serious one, and I am perfectly convinced that the gist of their accusations is correct; minute inquiries and cross-questioning failed to detect a flaw, and the tale, which was repeated to me in districts as far distant from one another as Mboga and Kavalli's, tallied in all respects, even in the numbers of women and cattle driven off and men killed. At five distinct villages, three of which were Wanyabuga villages and two Wakoba villages, I was assured that the old women were treated with the greatest cruelty. Three distinct tribes, the Balegga, Wanyabuga, and Wakoba, told the same story. This I considered sufficiently conclusive, as there is very little intertribal communication, and it could not have been "a put-up job," as my Balegga informants were 60 miles away from the others.

The journey up the west coast presented considerable difficulties, as after Kahoma the hills descend abruptly into the water, rocky headlands alternating with semicircular beaches (the deposits of the numerous streams which flow down into the lake). In parts the lake is exceedingly shallow, reeds growing at a distance of 2 miles from the shore; and the deposit brought down by these numerous mountain torrents must be enormous. This coast is of value for the magnificent timber that grows in all the gorges. Transporting the loads round the headlands in two tiny dugout canoes holding one load at a time was tedious work, and I was exceedingly glad to arrive at Mahagi, where the hills recede once more. From Wadelai, the British post on the Nile, I went to Afuddu (opposite Dufile) in a dugout canoe, and thence overland to Fort Berkeley (the old Bedden), our advance post. Inspector Chaltin, the able administrator of the Welle district of the Congo and the gallant conqueror of the Dervishes at Rejaf, kindly took me down to Kero, their advance post on the 5½ parallel, in one of their numerous steel whale-boats. Thence I travelled to Bohr with the Commandant Renier, who was sent to find news of the steamer with Captain Gage, Dr. Milne, and Commandant Henri, which had been away three months on a reconnaissance towards Khartum.

Bohr had been recently evacuated by the dervishes, and the strong fort was still in good preservation. Throwing away everything but absolute necessaries, I started with thirteen men on my 400 miles tramp through unknown swamp with many misgivings. The first two days the Dinkas were quite amenable to treatment, having been in contact with white men before. But afterwards I had a very anxious

time with the natives, as in places they were in enormous numbers, and, having never seen a white man, were quite ignorant of his ways, and even of the use of a gun. For some distance on the edge of the marsh there is a clearly defined stream, which loses itself in the vast lagoons that form near the upper junction of the Bahr-el-Zaraf. Many winding lagoons run for miles inland. When I passed they were stagnant, but I am inclined to think that they are really the outlets of tributary streams. The number of elephant on the edge of the swamp was prodigious, and they formed a serious impediment to our march, as they refused to move out of the way. Nearly every morning we wasted an hour or two shouting and throwing stones at solitary

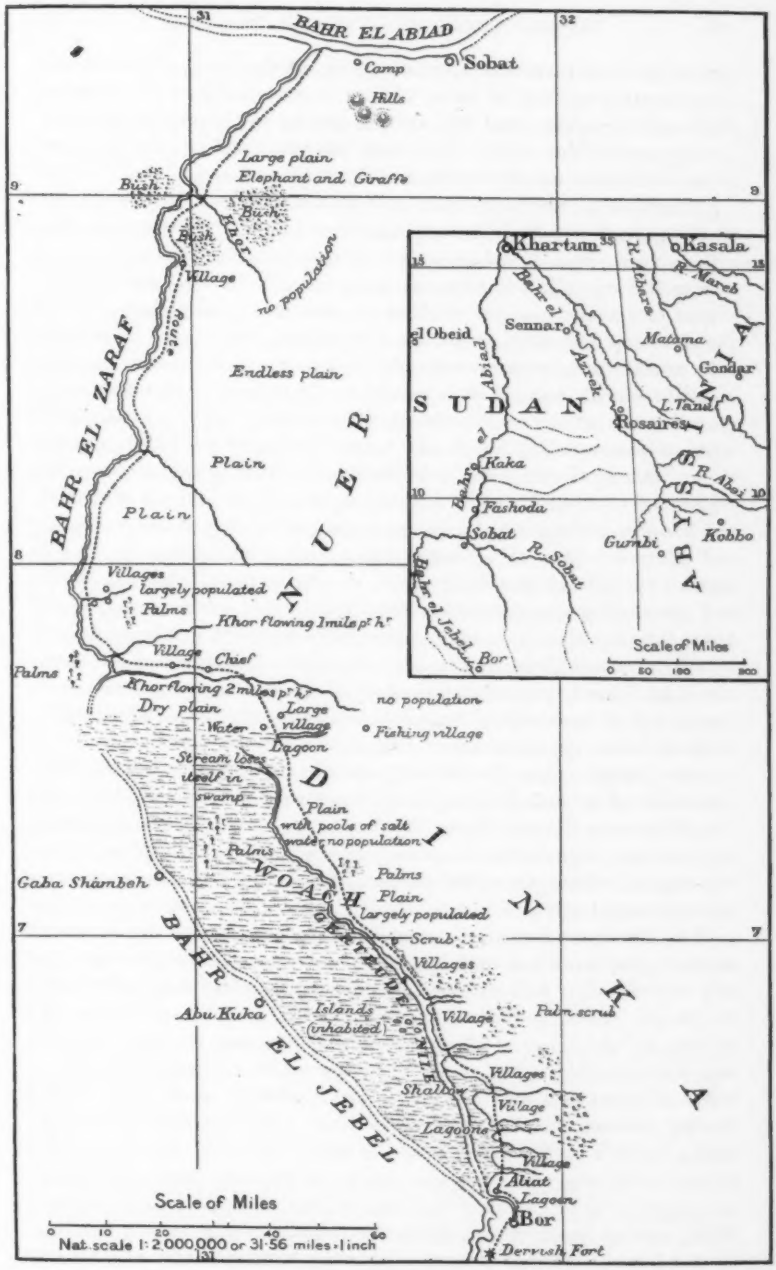
RUWENZORI, FROM THE WEST.

old tuskers and herds of younger elephant. One old fellow resented our terms of opprobrium and charged the caravan, but was turned with a shot from my double ·303. Banks and banks of hippopotami lay in every direction, but other game was scarce. The mosquitoes were appalling, and rapidly killed off two of my boys who had been sick; and the flies by day were even worse.

The Dinkas have enormous droves of cattle, which they value very highly; they never kill them for food, but from time to time tap the blood, which they drink greedily. They are of colossal stature; some of the herdmen I saw must have been very nearly 7 feet, and in every settlement the majority of the men towered above me, while my boys seemed the merest pigmies by their side. They smear themselves with a paste made of wood-ash to protect themselves from the bites of the

mosquitoes, and the long lines of warriors threading their way in single file through the marsh appear like so many grey spectres. They are absolutely nude, considering any sort of covering as effeminate. Their invariable weapons are a long club made of bastard ebony, a fish lance, and a broad-bladed spear, and the chiefs wear enormous ivory bracelets. The southern Dinkas cut their hair like a cock's comb, and the northern Dinkas train their hair like a mop. Both bleach it with manure.

Six days from Bohr the bush recedes 40 miles from the main channel of the Nile, and the swamp appears limitless; even from an anthill 30 feet high I could see nothing but a vast sea of reeds north, west, and south—not even the remotest suggestion of the far bank. At the curve of the swamp, before the dry ground again turns west towards the junction of the Bahr-el-Zaraf, there is a tribe quite distinct from the Dinkas, presumably the Woatcsh, of whom Sir Samuel Baker heard rumours. They are much smaller, and are ichthyophagic, possessing no cattle. The whole population of each village turned out in force and accompanied me to the next village, singing a wild ear-piercing chant, and continuously pointing to the sun. I suppose they imagined I had just left there. Some of the villages are far inland, and the women come long distances for water. I met many groups of them filling their pitchers, and they invariably treated me to a somewhat embarrassing dance; it was characterized by the wildest abandon, and terminated in every one hurling themselves in a mass on the ground and then dashing off in all directions into the bush, uttering shrieks impossible to describe. When I showed them beads or cloth and attempted to purchase food, they ran away, hiding their faces, and refused to look at them, thinking they were fetish. Even at night bands of natives would approach and chant to me, so that I was greatly relieved to once more enter the land of the Dinkas, who, even though rather obstreperous, at least refrained from singing. A remarkable thing was the extraordinary manner in which the Dinkas contrived to conceal their enormous herds of cattle until they were quite sure of my intentions; they kept them quiet by lighting small smoke fires under their nostrils, and we often walked right into the middle of a cattle village before we were aware of their proximity. A few miles north of the upper junction of the Bahr-el-Zaraf, a considerable stream flows from the east, which I am inclined to think flows from the marshes in which the Pibro, the large affluent of the Sobat, rises. For 30 miles at least it flows due east to west, and I am sure that it cannot rise in the Gondokoro hills, as suggested by Justus Perthes' map. Any drainage that comes from these hills must, from the contour of the country, flow into the Nile or into the marsh by the long lagoons that I have already mentioned, or down the other side of the watershed into the Sobat. Should my surmise as to the source of this affluent prove correct, the country between the Zaraf and Sobat is an island. The natives at Bohr



THE SWAMPS OF THE DINKA COUNTRY.

assured me that there was no water for many days east, and there was a considerable amount of water coming down the affluent in question. This would suggest that the streams passed by Lupton Bey in his journey east of Lado either drain into the Nile south of Bohr, or, what is more probable, into the marshes of the Pibro.

This Kohr is the northern boundary of the Dinkas. Shortly before reaching it, I was treacherously attacked by the inhabitants of the village near which I had camped. They gave some trouble in camp during the evening, but appeared quite friendly in the morning, and turned out to the number of about one hundred to accompany me on the march, as had often happened to me before. Sometimes there were fully one thousand natives with me; they took me as a huge jest, and wanted to see as much of it as possible. I had noticed that they were crowding round me, when suddenly they started, killed my best man with a spear-wound through the heart, and broke the skulls of two more; the rest threw down their loads and bolted, my small boy with my revolver among the rest. A quick right and left laid out the chief and his prime minister, and I swung round just in time to dodge a spear and to ward a blow at my head from a club, which felled me to my knees. I responded by poking my empty rifle in the pit of his stomach, and the ensuing pause gave me time to slip in a cartridge and finish him. The rest then drew off to about 300 yards, which they evidently considered a safe distance. An enormous man of about 6 feet 6 inches, who had caused most of the trouble in camp, tried to lead them on again, and if he is still alive, he knows more about the effects of a dumdum bullet than most men. I should much like to have given them a severe lesson, but, as I had very few cartridges, I knocked another gentleman off an anthill at long range; and, having thus given them an idea of the uses of a gun, made forced marches out of the country, fearing that they might return in overwhelming numbers. One of my boys, who lagged behind for a few moments despite my repeated warnings, vanished completely.

The Nuers are similar in appearance to the Dinkas, but rather smaller; they wear iron earrings, some of which were a foot in diameter, and cultivate their hair with the greatest care, binding it up with rings of cowries. Their method of showing respect, as with the Dinkas, is spitting on the object of their attentions. The last ten days of the march were terrible. Far as the eye could reach, one vast shimmering waste of burnt reed, sun-baked mud, and marabout storks; the Zaraf flowing between parallel mud-banks, lined with crocodiles; never a native, never a living beast, with the exception of the dismal hippos, solemn marabouts, and screaming kites; no trees, no bushes, no grass, nothing even to boil a cup of tea; and our diet of hippo meat or pelican steak, with no bread or even grain, was rapidly telling on our health: so that it was a moment of intense joy when I unexpectedly met Major

Dunn, of Major Peake's sudd-cutting expedition, who was up the Zaraf shooting.

It was difficult to realize that it was at last over. From the Sobat to Cairo was covered in a fortnight of wild hospitality, a distance equal to that which had necessitated eighteen months of weary toil. The maps were worked out with a watch and prismatic compass and aneroid; to regulate my errors, I took Usambara, Vichumbi, and Katwe as fixed points. We were unfortunate in having to leave our theodolite behind for lack of transport, and in losing our sextant and boiling-point thermometer in a raid that the Waruanda made on us one night at the beginning of our trip. The exceedingly hilly nature of part of the country traversed added to the difficulty of judging distance covered. However, I trust that the maps will more or less serve the purpose for which I intended them—that of clearly showing what difficulties the railway and telegraph will have to contend with—such as physical features, labour, and supplies. The immense difficulties of transport, and the work entailed in keeping a caravan thoroughly in hand, which is so essential when travelling without an armed force, precluded all possibility of making collections; and our photographic apparatus was spoilt by the negligence of the transport company that undertook its delivery. We are proud to be able to say that on one single occasion only we found it necessary to take food from the natives; they had all fled, and I took out ten men and cut about thirty bunches of bananas. I have always believed that more can be done with natives by tact and firmness than by a display of force, which makes them believe that their country is threatened; and certainly they nowhere imagined that we, with our ten rifles, had any warlike intentions. On only two occasions was I compelled to take life, and that in self-defence when actually attacked. Attacking people in case they may attack you, I have seen recommended, but I think it a superfluous and questionable precaution. Even the people of whom Sir Henry Stanley writes, "Marching to Wadelai would only be a useless waste of ammunition," I found perfectly tractable, and that although they have since his visit been subjected to the disturbing influence of the Belgian raid on Kavalli, and of the twenty rounds that I took with me I found it unnecessary to use one.

Before the reading of the paper, the PRESIDENT said: This evening we have the pleasure of welcoming our young friend Mr. Grogan, who has succeeded in making a most important and interesting journey from the Cape to the Mediterranean. That has been done by him for the first time, and so far as geographical work is concerned, he has much here to tell us, especially in the region north of Lake Tanganyika.

After the reading of the paper, the following discussion took place:—

The PRESIDENT: Mr. Grogan has mentioned to me the immense importance it was to him to have had such a travelling companion as Mr. Sharp, and he felt it as a great loss when Mr. Sharp had to leave him to return by way of Uganda.

We can imagine how important it must have been on such an expedition to have a good, well-tried companion. Mr. Sharp is here this evening, and perhaps he will address the meeting.

Very often great travellers are too modest to address meetings of this kind, but we have present this evening the members of an international convention, which I believe is assembled in London at present in order to take some international measures to prevent the total extirpation of wild animals in Africa; already three, beside the quagga, are extinct. Amongst other delegates we have one of the greatest of African travellers, Major Wissmann, and I trust that he, taking so deep an interest in Mr. Grogan's journey, will address a few words to us.

Major WISSMANN: The only fault I can find with the lecture we have just heard is that it was too short. We should all have liked to have heard more details about these interesting travels and observations. You can imagine how eagerly I look forward to some detailed description, because Mr. Grogan touched, going from the Zambezi to the north of Tanganyika, my tracks of 1881, 1887, and 1892. We may all, I think, congratulate Mr. Grogan on his great ability in dealing with the natives. The idea that first journeys are always the most dangerous is wrong; at least, I have always travelled more safely where no other European or Arab has been before me. The first contact with the new civilization is not always the test for the savages. The way in which Mr. Grogan has travelled through the countries of tribes bearing a very bad reputation is surprising. The famous Mfumbiro, which Mr. Grogan maintains exists only in the imagination of British statesmen, has been found by a German traveller, or rather its name was recognized, because I think Mr. Grogan saw the mountain under another name.

The PRESIDENT: We have also a very illustrious French traveller present. I am afraid he is not very conversant with our language, but if Captain Binger, who has done so much important work on the Niger, cares to address us in French, we shall be glad to welcome him here this evening.

We must all have listened to Mr. Grogan's paper with great interest. He has made a most remarkable journey; he is the first to go over that enormously long line of country which is eventually to carry a railroad, but I am afraid, from the difficulties he has described, that it will be a long time hence. In the meanwhile, Mr. Grogan has made a most remarkable journey; much of his work is of great interest and new to us, including that swamp he visited on the Chambezi, and the extremely interesting description he has given us of that previously unknown, or almost unknown, volcanic region to the south of the Albert Edward lake. He deserves the greatest credit for the observations he has made, and the care he has taken in making notes of all he has seen of interest to geographers. So young a man—for he is only twenty-five years of age—may look forward to a long career as a geographical explorer. I am sure you will wish me to express to him your thanks for his paper and the interesting photographs; also to express a hope that it will not be a very long time hence before he comes to us with another paper if possible of still greater interest and importance. It will be a very great mistake indeed for us to suppose that there is nothing left to discover. There are vast regions in all quarters of the globe besides the arctic and antarctic regions which are entirely unknown, and I look forward to such young men as Mr. Grogan to vie with the geographers of other countries in exploring unknown regions.

I have great pleasure in conveying to Mr. Grogan the thanks of the meeting for his most interesting paper.

THE PATAGONIAN CORDILLERA AND ITS MAIN RIVERS, BETWEEN 41° AND 48° SOUTH LATITUDE.*

By Dr. HANS STEFFEN.

To return to the lacustrine basin of the Puelo valley, we see that it is confined on its northern side by the snow-clad mountain mass already mentioned, and as yet unexplored; while on its southern side runs, in a decidedly south-easterly direction, the lofty and steep barrier of the "Cordon de las Hualas," the precipitous flanks of which, towards the valley depression, offer a truly impressive sight. They fall hardly short of the perpendicular, and afford a most precarious hold for a scanty vegetation. Enormous masses of rocks detached from its upper parts have been heaped chaotically in spots near the shores of those lakes, where they lie now half hidden amongst the outgrowth of vegetation. The Cordon de las Hualas, crowned by a high crest and snow-fields, keeps on its parallelism with the following part of the Puelo valley, that is characterized by an alternate succession of extensive widenings and narrow defiles between minor chains, this being another typical feature in all the large rivers of Chilean Patagonia. Within the continuous depression of the main valley the river meanders for long stretches between low banks formed by alluvial river deposits, covered with exuberant vegetation. The river-bed is bounded by extensive gravel or sand beaches, and the cliffs of the hills bordering the valley are far enough from the river channel to allow the construction of roads on both sides. There are frequently found amidst those white plains swampy grounds, bare of trees, or partly covered with bushes of scanty ciprés and slim bamboos; those swamps are called in Chile, "ñadis" or "trapenes," and their origin is explained by the deficient sloping of long stretches of ground, underneath which there is an impermeable layer of subsoil, this preventing the drainage of the water accumulated by the incessant rainfalls. The alluvial fields at the river-sides often show evident indications of their being covered by the great floods which, we have evidence of it, sometimes rise as much as 15 to 20 feet above the regular summer level of the river. This is obviously a great drawback to the agricultural use of such lands; but there are also extensive plains of gentle slope, and sufficient altitude over the river, to be out of the range of floods.

These plains, called "llanadas" by the Chilotes, are frequently, as in the Puelo valley, of such an extent that inexperienced people getting sight of them from a low point of the valley have been led to

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* Read at the Royal Geographical Society, March 19, 1900. Map, p. 140. It is hoped to publish a more detailed map in a future number. Continued from p. 38.

believe that they were nearing the borders of the Cordillera, the eastern ranges of which are sometimes barely seen on the distant horizon of these plains. They are covered by extensive forests of high trees, among which are to be found, besides those growing near the coast, as the groups of *Myrtaceæ* and *Cupuliferæ*, certain species that do not grow on the coast, as the *Libocedrus chilensis*, commonly called "Cedro" or "Ciprés de la montaña," and the timber of which is particularly valuable for the construction of buildings, ships, etc. Under the lofty trees grows the dense underbrush, mainly composed of "colihuales," so thickly pressed sometimes that they do not allow any other vegetation, the fallen leaves being then the only clothing of the ground. Some of these colihue-bamboos are 25 to 27 feet high, and 4 inches round their base. Beautiful creepers (*Mitraria*, *Boquila*, *Luzuriaga*, etc.), with white or red flowers, are entangled between the trees, rendering the march very troublesome. When the colihuales are not so thick, the ground is carpeted by a deep moss covering, saturated like sponges with rain-water, and a profusion of ferns, amongst which the *Alsophila pruinata* is conspicuous by its colossal dimensions, break the monotony of the forest. Day after day we marched on level ground, the sombre cover of the evergreen foliage of the trees allowing but little of the daylight to pass, and where the abundance of moisture prevents the evaporation and permeates the air with an intense smell of dampness proceeding from the numberless fallen tree-trunks in course of decomposition, and from the dense layer of decayed leaves and mould covering the soil.

The transition between the orographical characters of the broad parts of the valley and the narrow is usually rapid, and this happens at the intermediate course of the Puelo valley. The traveller finds himself of a sudden at the entrance of a darksome defile with perpendicular walls, the minor windings of which correspond to the rocky spurs encroaching on the river-bed from each side. The advance by land in such defiles would meet with insuperable obstacles, as there are such tight places that even the most skilful mountaineer would not be able to find his way by the steep sides that confine the river. These narrow parts would form insurmountable obstruction if the borders or cliffs reached a considerable height; but as a general rule their upper part does not rise more than 200 to 300 feet above the river, being formed by plains, as an extension of the "llanadas" of the wider valley. The path must be looked for then, making a *détour* by these upper parts, and to arrive there it will sometimes be necessary to go up and down secondary spurs, and to cross over ditches and torrents on their way down from the upper terrace to the level of the river, which is frequently reached by the waters in the shape of a cascade over the cliff border.

An interesting feature to be observed in the forms of this inter-

mediary part of the valley are the gravel and pebble-stone terraces that lie with some interruptions, forming successive steps; these terraces are evidently the remains of deposits corresponding to the various levels of the river course at former periods. At some places where the Puelo valley is remarkably wide, as at that called "Corrales" by us, the successive terraces are outlined with surprising regularity along the slopes confining the circus-like enclosure of the valley. Four different levels may be detected from afar, their perfectly horizontal upper lines contrasting visibly with the rugged outline of the surrounding mountains. In some other valleys, as in that of the Cisnes river, which will be described further on, and in the Corintos valley, tributary

RIVER AISEN NEAR ITS MOUTH (LOOKING WEST).

to the Futaleufú-Yelcho, the successive terraces are so regularly heaped up that they look like a railway embankment in course of construction. The Patagonian Cordilleran valleys offer thus many instances of a phenomenon that has been the object of much study in the Alps, Pyrenees, and other mountains of the Old World; in both cases the explanation is to be found in the periodical accumulation of increased deposits at the time of greater glacial activity and their subsequent wearing out by the streams. We have observed in this respect an interesting fact in the Puelo country; it is that the remains of those terraces are precisely found in such places of the main valley as lie directly down stream of the mouths of the tributary torrents into those Cordilleran depressions, where the bordering mountains show actual glaciers which still contribute to swell the volume of waters of the main river.

We must make here some remarks about the orographical forms of

the part of the Cordillera that we have reached through the course of the Puelo valley.

We have mentioned the high barrier of the Hualas range, which lies along the southern side of that valley, and extends without a perceptible break over 50 miles in a south-easterly direction, until it is knit together with the powerful mass of andine mountains, 6000 to 8000 feet high, that surround on the southern side the Lake Superior basin, which must be considered as the main receptacle of water feeding river Puelo. Three or four rivers of some importance breaking down through the ravines of the Hualas range to join the Puelo, show by the aspect of their waters that they originate in snowfields and hidden glaciers of interior slopes and depressions within the mountains. On the opposite northern side of the Puelo valley there is no consistent range of such continuity as that of Hualas; the transversal valleys and depressions of the Cordillera are here deeper and of a more marked character, chiefly that of the Manso valley joining at a straight angle the Puelo depression. The whole piece of land enclosed by the northern course of the river Manso and the central Puelo valley is an entanglement of mountain masses and groups, where it would be utterly impossible to point out anything like a predominant chain in a meridional direction. Towards the Manso side there are but middle-sized hill chains, not over 5300 feet high (Cerro Mirador) of irregular and flat shapes; it is only towards the south and south-east that consistent though longitudinal short ranges are outlined, showing their dentallated crests above the snow-line. Amongst those it is worth mentioning, the "Cordon de la Sierra" running some 15 miles in a south-easterly direction in front of the Hualas range. Somewhat to the east of the Sierra range, but divided from it by deep ravines, lies the conspicuous "Serrucho" (Saw) group of an altitude over 8200 feet, and the more prominent amongst some five or six lofty massives with battlement-like cliffs, heaped up one upon the other over the lower slopes, and in some way connected with each other by much-crevassed secondary ranges. The latter series of groups is the only one in this region stretching longitudinally to some extent, this being little more than 20 miles from north to south; but we must observe that it is in no manner orographically connected with the Cordilleran ranges, nor with those situated to the north of the Manso valley, neither with the Cordon de las Hualas and the Andine masses lying at the south of Lake Superior.

When the grand panorama of these Cordilleras is surveyed from a prominent summit, its salient outlines show the pointed peaks and saw-teeth shaped needles frequently repeated, as probable indications of an identical geological formation. Other crests take the form of church towers and bastion-like walls, at the foot of which there is hardly any place for the accumulation of perpetual snow. Generally speaking, the western slopes are of a more abrupt character, mostly composed of bare

inaccessible rocks, while the eastern declivities contain some snow-fields and hanging glaciers. The aspect of the intermediary Puelo and Manso Cordilleras is rendered extremely desolate by the destruction of the forests that have been consumed some ten years ago by enormous fires, proceeding doubtless from the east.

It is difficult to imagine the immensity of the vast sea of flames driven with irresistible force by the eastern winds, consuming the forests and underbrush of the valleys and surrounding slopes until it was stopped by the coast forests impregnated with moisture. Crossing over rivers and even minor lakes, these conflagrations progressed rapidly through the cedro woods on the level tracks of the valley, where large amounts of these valuable trees have been destroyed. I have observed in all my journeys through the Patagonian Cordilleras vestiges of fires, some of which had taken place at very remote periods, and were only detected by the presence of a few carbonized trees among the new vegetation, and others more recent, while some were still in actual progress. It is certain that the origin of those conflagrations lies in the subandine region which forms the transition between the forest-covered mountains of the interior parts of the Cordilleras and the open Patagonian plain that begins at the Lake of Nahuelhuapi, and are extended without interruption towards the south. As there is no impediment for the communication between this intermediary region and the Pampa lands, frequently visited since former times by nomadic Indians or settlers, always drawn by the natural riches of the eastern Cordilleran valleys, it cannot be doubted that such fires were caused by men, either intentionally or by sheer negligence. From the subandine valleys these fires have progressed, following the large transversal openings, by the forests of the intermediary mountains without reaching, as it seems, any point of the seashore.

We have crossed through the more compact mass of the Cordillera guided by the course of a main valley, and have arrived now at that more open region which we have already qualified as subandine, the most remarkable feature of which is the existence of spacious valleys, partly occupied by extensive pampas and partly by lakes or lagoons, drained almost without exception by the main rivers to the Pacific. In the region we are dealing with, this type of valleys is represented by the "Valle Nuevo" or "Valle Florido," stretching northwards from Lake Superior at the eastern base of the longitudinal series of mountains referred to before, nearly as far as the borders of the Upper Manso valley, that is to say, some 25 miles' distance, and confined at the eastern side by ranges of medium height. Although there is no doubt that the "Nuevo valley" ought to be considered as a Cordilleran valley; the feature of the landscape is, however, considerably different from that of the valleys close to the Pacific. In the first place, there is a marked diminution of atmospheric moisture, and, as a consequence, there is

a partial substitution of the dense and darksome forests by open fields, their vegetation being of a similar kind to that of the grassy plains lying at the east of the dividing ranges. Notwithstanding, the rains are still frequent, and at the winter season the valleys and hills are sometimes covered with snow for several days. It is not an unrecorded occurrence that furious rain-storms from the west and north-west that pour down on the littoral, find their way through the wide opening of the Puelo valley headwards as far as the Nuevo valley region; it being usually the case, however, that the heaviest downpour occurs on the coast mountains, and only the last showers fall eventually on the upper valleys.

The advantageous topographical and climatic conditions of Valle Nuevo have been for several years past a powerful attraction to the incoming of settlers. We found there, in 1895, some families of Chilean origin, who had crossed from the Argentine side and gradually taken possession of what to-day are flourishing cattle-farms. There is no doubt that the boundary question between the two countries once settled, the Nuevo and Upper Manso valleys would soon be the site of important colonies. Besides, traces of ancient settlements are not wanting, being very likely Indians who retired backwards as the new settlers were advancing; we have been confirmed in this supposition by the discovery of a large number of wild cattle which we found isolated in a corner of the Manso valley, far off from any human habitation.

As I have already said, Nuevo valley is fully included in the Puelo basin, which even penetrates between the ranges, partly high and well defined, that form its divide from the basin of the Argentine river Chubut. These mountains are mostly bare or covered by bunches of the predominant *Graminea* of the pampa, called in Chile "coirón" (*Festuca*), and of an *Umbellifera*, equally characteristic of the Patagonian uplands, the *Mulinum*.

It would not be correct to speak here, any more than in many other parts of the Cordillera, of a continuous water-parting range between the Chubut and Puelo basins, though some ranges of a certain extent and successive summits rising above 6500 feet, occasionally coincide with the divide. The continuity of such ranges is usually broken by cols or depressions more or less wide and flat, and even the divide does not keep long over the same range, but runs from one to another parallel to it, either descending to an interposing depression or crossing over by a connecting link of hills.

One of the most typical among the latter depressions is the pass communicating the Quemquemtreu river valley that slopes down to the Valle Nuevo with the Maiten and Chubut valleys. The height of the pass being 2550 feet above sea-level, there are 1430 feet to climb from the bottom of Valle Nuevo, while there are only 230 feet to come down to the Chubut river side. These figures show the great disparity of

level between the main valleys at either side of the water-parting line; we see that at certain places the divide is not very prominent over the level of the high pampas bordering the eastern slopes of the Cordillera; but it is not to be taken for granted that this is usually the case, as out of about 65 miles of the Puelo-Chubut divide, between the latitudes of 41° 30′ and 42° 10′, nearly 50 run over high ridges and peaks, as the "Cerro de la Carrera" (7630 feet), "La Sierra" (7440 feet), "Cerro de Pillaquitrón" (7130 feet), these being the culminating points amongst several rugged ranges of old plutonic formation. About the latitude 41° 30′ another longitudinal range becomes detached, and runs south at the east of the Chubut valley with slight interruptions as far as

RIVER MAÑIUALES NEAR ITS ORIGIN (LOOKING NORTH).

lat. 42° 20′, where this river alters its course decidedly to the east towards the open plains of Patagonia.

The description that has just been made of the different aspects and features that are successively presented to an explorer of the Cordilleras when he crosses them at the Puelo region, might be more or less applied as a typical one to the other valleys and mountains extending to the south. I will, therefore, only point out the broad structural lines and the most interesting and practical features of the rest of the vast country over which our explorations have been effected.

The next large river draining a considerable area to the Pacific between the parallels 42° 20′ and 43° 25′, is Rio Yelcho, being the same as was known in its upper course, several years before its lower course was discovered, under the name of "Staleufú" (more properly spelled "Futaleufú"), which in Araucanian dialect means "The Big

River." The true connection between the upper and lower courses just mentioned has only been established a year ago by the explorer Dr. Paul Krüger, then attached to the Chilean Boundary Commission; while the Upper Futaleufú basin discovered by Colonel Fontana in 1885, had been partly surveyed in 1896 by Mr. Waag and others of the Argentine Boundary Commission, and one year after by Dr. Krüger and companions, who crossed over to this basin from the Pacific coast by the Reñihué valley.

The large Yelcho-Futaleufú basin surrounds by the east and south that of Rio Reñihué; the latter as well as the lower Yelcho course running in the north-westerly direction, which has been observed before to be that of the most important structural lines in Western Patagonia. The Reñihué valley lands are not of any special value, their soil being mostly volcanic detritus proceeding from the Minchinmávida volcano, the northern slopes of which form the borders of the valley. The river Reñihué is of a torrential character and not fit for navigation, and the way to its headwaters is intercepted by a lake surrounded by steep-sided hills, leaving no possible path.

A secondary pass, some 3200 feet over the sea, leads from the Reñihué headwaters to a complex system of Andine lakes lying eastwards, and only at about 1600 feet above sea-level, all of them drained by the river Futaleufú, the course of which is here southerly by some 35 miles, between snow-covered ranges of mountains, stretched in the same general direction, but amongst which we should not venture to single out one as the main or principal range of these Cordilleras. The Futaleufú valley and its numerous branches between the mountains contain extensive and fertile lands well adapted for settlements, and especially for cattle farms. Some parts are particularly valuable on account of large *alerce* forests, where some trees are found of 10 or 12 feet diameter, and many thousands from 4 to 6 feet. Cedros and other useful timber are also abundant. By a well-conducted development of these riches it would be possible to make use of the river Futaleufú and its tributaries to carry down the timber and to collect it in the lakes interrupting the river course.

Among the longitudinal chains bordering the Futaleufú valley on the eastern side, the most conspicuous is "Sierra Manuel Rodriguez" ("Rivadavia" of Argentine maps), which extends from north to south some 20 miles, with peaks rising more than 6500 feet above the sea, and is bordered towards the east by another longitudinal depression of the Cordillera where runs the Perzey river, tributary to the river Futaleufú, through the river Corintos. To the east of the river Perzey stands the divide range from whence the waters are drained to the Chubut system. This range runs without break between parallels 42° 54′ and 42° 20′, its summits rising from 4000 to 7100 feet above the sea; its southern part is called "Cordon de Esquel," and the northern one "Cordon de Lelej,"

in conformity to the names of the streams flowing eastward down its slopes.

Towards the latitude 42° 20′ we arrive at a curious break in the orographical connection between the dividing ranges. The deep and wide breach through which the Chubut river diverts its course eastwards is interposed between the Lelej range and that bordering Chubut valley to the east, and the continental divide is laid down, across undulating hillocks and grassy grounds, at an altitude of 2300 to 3000 feet over sea level, for some 18 miles, till it rises again to the crest of the northern ranges already described. This low part of the divide obliquely crosses the long depression that as a southerly extension of the Upper Chubut valley penetrates into the Cordillera as far as the Upper Futaleufú lake basins. Where the divide crosses this depression, begin the headwaters of Cholila valley, drained to the Futaleufú, that competes as to its favourable conditions for settlements with Nuevo, Perzey, and other subandine valleys.

All explorers who have visited the region of the beautiful subandine basins, with their large valleys, their various lakes and their glacial and fluviatile deposit terraces, have gained the conviction that they were within the precincts of a vast ancient lacustrine basin, and have advanced more or less well-founded opinions about its extension and the geological causes which have produced the actual conformation of the ground and its water-parting anomalies. There is no doubt that all these subandine valleys lie within the precincts of ancient glaciers, as the terraces and transported materials heaped up on the valley borders tend to prove, as well as the old moraines, forming now long series of hillocks, and the erratic boulders scattered irregularly over the country. Consequently, to explain the actual conformation, the activity of the glaciers, which have been at work for a long time, ought to be taken into account; but there is no doubt, at the same time, that the main cordilleran depressions coincide with early erosion valleys, that were laid out beforehand, so to say, along the tectonic lines of the primary Andine system, and are occupied to-day by the great water-courses, as the Puelo, Yelcho, etc. Into the cast of these valleys, that by the effect of retrogressive erosion had branched up eastwards through the more compact masses of the Cordillera, commonly known as its central range, the glaciers found an easy way at the ice period, when the enormous heaps of ice blocked up at the back of the barriers of detritus accumulated by the erosive forces dug down and widened their bottom, leaving in their places, after the thawing of the ice, the primary lakes of the subandine region. These lakes drained towards the Pacific, as the previous slopes of the valley trend that way, and the augmented force of erosion worked also from this side. It is not, moreover, to be denied that, in certain cases, the latter force has been able to capture for the western basins streams and waters primarily flowing to the east, although positive and frequent

instances of this are only found much farther south, towards Lake Buenos Aires and San Martin.

To return to the river Yelcho-Futaleufú, there is still to be said that its lower course is interrupted by a beautiful lake 15 miles long in the north-westerly direction, which is the bearing of the principal axis of the valley. It has been ascertained that all the Yelcho lower course, including the lake and nearly 10 miles headwards, that is, for more than 50 miles in the aforesaid direction, is a good waterway. Its southern border is backed by snow-clad ranges and glaciers, dividing it from the Corcovado valley, both depressions keeping a very close parallelism to each other.

The middle course of the river Yelcho is through another depression, that corresponds to a different system of structural lines in the Cordillera, as frequent as the first, their direction being north-easterly. This part of the river course is of an impressing, torrential character, and forces its way through a long series of narrow defiles, amidst the walls of which the waters rush, forming rapids and cascades. These narrow places occurring in the river course do not affect, however, the conformation of the main valley, which maintains its width of from 1 to 2 miles and contains wooded plains stretched at a level 300 to 600 feet higher than the river bed, and over the low range of hills, the cliffs of which are the walls of the defiles. It will be apparently easy to clear a path on the northern side of this part of the valley, very rich in cedro trees, for some 40 miles, where it should meet the actual trails frequented by the settlers of the "16th of October" valley.

Very little is known about the vast extent of Cordillera enclosed by the Reñihué, Futaleufú, and Yelcho valleys beyond the towering Minchinmávida peak; so that we do not think it justified to draw up precisely on this blank a main chain of the Cordillera, as Argentine geographers would have it.

The best known among the subandine valleys tributaries to the Futaleufú is the "Valle 16 de Octubre," where a few hundred Welsh settlers are apparently thriving in the land and cattle-farm business. The particular conformation of the divide on the borders of subandine valleys, where wide breaches are filled up by glacially produced hillocks, occur again between the 42° 54′ and 43° 30′ parallels, where the water-parting between the Corintos and Teca valleys takes place, the former a tributary of the Futaleufú, and the latter of the Chubut basins. The flat depressions, the largest of which bear the name of Súnica Paria (2000 feet above sea-level), break the continuity of the dividing ridge at the south of the Esquel range, as an encroachment of the Esquel plain, where incomplete rivers and undrained lakelets are found, up to the upper swelling of the land, from where some small streams find their course down to river Corintos. However, at the north-west of Súnica Paria the water-parting takes place on the summits of the Pico Thomas

massive (5550 feet), and to the south of the same, from the Cerro Teca summit (4820 feet) by the mountain-range bordering the basin of lakelet Cronómetro to the east and the rugged Caquel range, that ends up at the Mount Cutch summit rising 6600 feet above sea-level. The Teca valley stretched between the Caquel range and another meridional and extended range that rises up to about 5000 feet above sea-level, is covered with wide pasture-fields, and at its bottom lies the well-trailed road leading to Nahuelhuapi, along which have been erected many settlers' and traders' dwellings.

The river Palena, to which we come next, has been known for more than a century. The expedition undertaken by me in the summer

BAKER CHANNEL, FROM A HARBOUR IN ITS CENTRAL PART (LOOKING SOUTH-WEST).

of 1893 to 1894, the two sections of which coming from opposite sides effected a junction on the river valley, dispelled all doubt as to the identity of the Palena river of the Pacific coast with Colonel Fontana's Carrileufú. We should mention that the latter has retained up to this date the name of "Rio Corcovado," that had been also originally given to Futaleufú river in the erroneous belief that it was the upper course of the Chilean Corcovado river.

The lower course of the river Palena runs tortuously with a great volume of swift water in a wide alluvial valley lying to the west-north-west nearly up to its confluence with its first large tributary, the Claro, the valley of which, occupied by large lakes, runs in a similar direction. The river Palena comes here from another depression almost

at right angles with the first one, presenting another instance of the disposition already observed in the primary structural lines of the Cordillera. The valley itself maintains its width of 2 to 3 miles, but the river-bed is obstructed by the rocky walls of low hills filling the bottom of the depression, owing to which a long series of very dangerous rapids is formed. By a northern extension of this second depression, another tributary, Rio Frio, comes down; its volume of water is large, and it is turbid and remarkably cold, as the chief sources originate in the extensive snow-fields and glaciers of the rough ranges rising at either side of the valley. By the combination of our survey of the river Palena and those of the Yelcho and Corcovado valleys, we arrive at the very probable conclusion that the Rio Frio depression is an extension of that one where the middle course of the Yelcho lies; this would also explain the persistency displayed by the Argentine explorers engaged in ascertaining the hydrographic relations of the Futaleufú, in affirming the identity of the latter with Rio Frio, and its being, consequently, a tributary to the Palena basin. The greater part of the water of Rio Frio seems to proceed from a north-western branch, the headwaters of which are collected on the snow-clad mountains forming the divide with the Corcovado headwaters, and from the volcanic group of Mount Yanteles.

Higher up from its junction with Rio Frio, the Palena, which may retain its former Indian name Carrileufu (Green River), runs into another depression of the Cordillera in a north-easterly direction, its spacious valley presenting alternate plains thickly wooded, and narrow defiles, sometimes assuming the aspects of canyons with perpendicular walls of moderate height. On the upper terraces of those banks a road communicating with the coast might be constructed by the northern side, the only difficult place being the crossing of Rio Frio by reason of the considerable and changeable volume of its rushing waters. Besides, the lower Palena is navigable even by steam launches up to the Rio Claro junction, about 23 miles; and at its mouth the river is connected by two arms flowing through the alluvial banks of Isla Leones with a very good harbour of the fjord, called "Estero Pichi-Palena." The main value of the Lower and Central Palena lies chiefly in the extensive plains of its valley, that properly managed could be converted into pasturages and farms. The forests show already a decrease in the valuable cedro timber, though the upper and interior valleys still contain a considerable quantity of that wood.

Like the formerly described main fluvial arteries, the river Palena has extensive subandine valleys of a much greater practical value for settlements than the coast and intermediate valleys. Such are the so-called "Valle Frio," a northern tributary, and the upper Carrileufu valley (locally known as "Corcovado"), from its exit from Lake Palena (or General Paz) down to its junction with Rio Las Casas (or

Huemules). Both valleys are bounded westwards by powerful masses of Cordillera yet unexplored, and eastwards by lesser ranges that in places are so depressed and flattened, that the continental water-parting is effected in swamps or marshes instead of on a well-defined ridge. That happens at the divide between the headwaters of the river Las Casas and the river Teca, where the cases of Cholila and Súnica Paria are repeated; this is the place called Weckel by Captain Musters in his famous excursion where he came to hunt wild cattle with the Tehuelche Indians, whose fellow-traveller he had become. He says in his narrative* that he crossed the watershed, and undoubtedly he was the first white man to do so and reach the Palena basin.

The region close to the divide by the eastern side is likewise occupied by subandine valleys extended meridionally, bordered by well-defined ranges of an Andine character as it seems to us impossible to deny. We have mentioned already the Upper Teca valley, the southern extension of which is easily recognized in the Putrachoique and Chergue valleys, both tributaries of the river Jénua, a branch of the Senguer. The bordering ranges, stretching without a break from north to south, do not certainly present an aspect so impressive as the snow-clad mountains near the coast, this being due to their initial base-level being very much higher. The range called "Serranía de Tepuel" shows, however, at the east of Putrachoique valley, numerous rugged peaks rising 4300 to 4900 feet over the sea; and its southern extension, the Chergue range, is not much lower. The eastern slopes of these ranges descend gradually, merging into the Patagonian plains, the aridity of which offers a remarkable contrast with the rich lands of the subandine valleys.

The region where this water-parting is effected, being confined towards the east by the Tepuel and Chergue ranges, is included, according to our opinion, within the Andine orographical system, and in that part of it which we have designated under the special term of subandine. Near the 44th parallel the divide comes over a high and well-defined ridge (4600 feet), parting the waters flowing through the Ñirehuau towards river Chergue from some streams, tributaries to the Carrileufu. In its progress to the south the divide goes down over undulating hills to 2840 feet, and rises again to about 4000 feet at the "Loma Baguales," where surge some of the sources of the river Pico, probably the upper course of the river Claro, the affluent to the Lower Palena.

We should remark that the interior of the vast Andine region around which winds northwards the Carrileufu-Palena, and through which passes the Pico-Claro river, remains up to this day a *terra incognita*, only some prominent peaks, as Mount Serrano, Maldonado, and others having been sighted by the explorers. Their outlines show a remarkable

* 'At Home with the Patagonians,' by G. Ch. Musters (London, 1871), p. 148.

resemblance to each other, being cut by deep breaches or ravines; and in their geological formation granitic rocks predominate, with isolated norites and diabases. Along the middle course of the river, as far as the confluence of the Carrileufu and Rio Frio, the granites alternate with quartz-porphyric rocks, and farther up, where the canyon-like channel begins, we found banks of a hard blue-grey limestone of probably Mesozoic age.

While the Lower Palena waterway was already known by the eighteenth century missionaries, it is only very recently that information has come to hand about the next large Patagonian river on the west side, that empties its waters by 44° 50′ S. lat. in Poyehuapi Inlet, which, together with Cay and Yacaf channels, run between the mainland and the mountainous and well-wooded island Magdalena. Captain Simpson, in a reconnoitring expedition along those channels, saw the mouth of that river, to which he gave the name of "Cisnes," on account of the large number of swans he found on that place. The river itself has remained entirely unknown, until I explored it in 1897 and 1898, and ascertained its identity with the stream called on its upper course "Frias" or "Tucutucos," by its Argentine discoverers, who had ventured various hypotheses as to its hydrographic relations; some of them believing it to be a southern branch of river Palena, while others imagined it to pass through lakes, that do not exist, to Aisen river. The question was further complicated by the discovery of Lake La Plata, from which the river Senguer originates, and to which an Argentine map published in 1897 gave such an extension to the west, that only a very short space of Cordillera was shown between the western extremity of the lake and the Pacific shores in Poyehuapi Inlet. I found, however, that the distance was twice that shown on the map, and that there were interposed between the coast and the lake, the deep depression containing the main valley of river Cisnes and the powerful Cordillera ranges bordering it on both sides.

The river Cisnes' lower course, as well as the ranges referred to, runs in an east-north-east direction for about 18 miles, and deviates then almost due east for some 12 miles, this part of the valley widening, in places occupied by well-wooded plains, where the mañiu and ciprés are abundant, while alerce and cedro are no longer found. I have surveyed carefully this part of the country from the summit of Cerro del Gallo (4200 feet) and Cordon de los Huemules (4500 feet), as well as from another hilltop at the south of the valley, and have made an accessory excursion to Lake Torres; all of which enables me to state that the whole country sighted on those occasions does not contain any meridional dominant or principal chain; on the contrary, short ranges and high, snow-clad, isolated groups prevail either at the north and to the south of the Cisnes valley, their trend being south-easterly, and at the same time interrupted by deep valleys and lakelet basins lying in the same

direction. Among these valleys the largest is that containing the small Lake Las Torres, into the waters of which plunge straight down the precipitous slopes of the mountain to which we gave the same name. At the back, that is to say to the east, of the latter, rise snow-covered Cordilleras, from 5300 to 5600 feet high, which have been accepted by a Chilean Boundary Commission in 1898–99 as the divide in this place, and their eastern sides sloping down into Lake La Plata. The longitudinal extent of those dividing mountains does not exceed, however, over 7 to 8 miles, as they come to an end towards the north, on the border of the Cisnes valley, which runs here decidedly to the north-east, while on the southern side another depression runs to the

RIVER BAKER IN ITS LOWER COURSE (LOOKING SOUTH-WEST).

south-east, from Lake Torres towards the Upper Mañiuales valley, that is, the northern head-waters of river Aisen.

The La Plata and Fontana lakes basin (the level of the waters being about 3100 feet above the sea) is a vast and hollow depression of the Cordillera some 35 miles in length and in a general direction to the east-south-east. This basin is divided from the Cisnes and Mañiuales valleys by unbroken cordilleran ranges, with summits rising above 6500 feet, and containing glaciers as those from which spring the sources of river Mañiuales.

The northern range extends eastwards, bearing the divide until its intersection with apparently meridional parallel ranges that form the

upper Gato and Apulen valleys, tributaries to the Senguer, and, lowering, gradually merge into the Senguer Pampa.

The southern range is stretched eastwards to the "Pico Katterfeld" (6135 feet), from whence another range extends for some 28 miles, formed of flat-top hills like "Cerro Guia" and "Cerro Kamkelshake," the slopes of the latter merging into the pampa, where the "Arroyo Verde" and "Rio Senguer" meet farther on.

The foregoing description shows how, to the south of the 44th parallel, the formation of extensive subandine valleys in a southerly direction disappears. The valleys of the river Cisnes' southern upper course, of some tributaries to the Apulen and Gato rivers stretching in that general direction, do not present an extension to be compared with that of the main Cisnes valley. A wide stretch of pampean ground comes from the east, encroaching into this valley to near the foot of Cerro Cáceres (5350 feet), which is the culminating point of the various ranges on the northern side of the depression. These grounds are doubtlessly especially favourable to cattle-raising; though there is no scarcity of land fit for culture, there is at present a great drawback in the shape of the numberless small rodents called "Tucutucos" (*Ctenomys*), that undermine the best soil, and are only made to disappear little by little as the settlers bring cattle or other domestic animals on to the ground; the good effect of this has already been proved in many sheep-pastures on the Magellanic territory.

As on other subandine valleys, the animal kingdom is here much better represented than in the dark forests of the coast region which, however picturesque they may be, are sadly in want of the animation that forms the particular attraction of primeval forests in other quarters of the globe. The so-called lions (*pumas*) hunt everywhere, but are great cowards, and are hardly to be seen; on the other hand, several species of foxes are a real nuisance, and extend their incursions to the very tents of the travellers. The animal that excites the greatest interest in these places is, however, the Huemul (*Cervus chilensis*) species of deer, whose habitat extends all over Andine Patagonia, exception being made of the thick woods and dense bamboo shrubberies of the Pacific coast; huemules are found in great number in the intermediate region of subandine valleys, as distant from the wet and impenetrable forests of the coast as from the barren Patagonian uplands. From the river Aisen southwards they begin to descend more near the seashore, as the forests are not so dense in the valleys; but everywhere the region of quilas and colihues (bamboos) has been passed, herds of deer are seen, even among the snow. The flesh of the huemules is an excellent food, and it is easy to hunt them. During the Cisnes expedition, as most of our provisions were rather spoiled on account of the excessive rains, we have been for whole weeks subsisting on such meat. When we go farther east, among the bare hills and undulating

ground of the so-called Patagonian pampa, huemules alternate with guanacos, the real abode of the latter being the arid Patagonian plains.

A large space of the Andine region to the south of the 45th parallel is occupied by the fluvial basin of river Aisen and its two main branches, of about the same importance, the rivers Mañiuales and Simpson, the union of which takes place at Flores island, some 18 miles from the sea-shore. Both of these rivers were explored by the two parties into which I divided my expedition during the summer season of 1896–97; the first one, under Mr. de Fischer, taking charge of Simpson river and its tributary, Coihaique river; the other coming up with me to the Mañiuales headwaters, and crossing over the southern slopes of Lake Fontana's Cordillera to the region of the divide. This section of the divide has been, moreover, surveyed by boundary commissions of both countries in recent seasons.

The deep depression of the lower course of the Aisen river forms the eastward extension of the beautiful Aisen fjord or inlet, stretched some 35 miles inland, and at the bottom of which, near the river mouth, there is a well-sheltered though rather small harbour. Although the woods covering the lower alluvial valley contain the same kind of trees and shrubbery already spoken of when describing the northern valleys, we have observed that this country is not so thickly wooded, and landscapes of a park-like aspect are sighted, where the paths are cleared with relative ease. Everywhere traces are found of the labour of the Chilote woodmen, who frequently penetrate through these forests to obtain the valuable ciprés timber. The river banks are usually high and, consequently, protected against the winter floods, and have, with their quila shrubberies and deep layer of vegetable soil, all the conditions that could be required for settlements.

In the neighbourhood of Flores island the main depression of the Aisen valley, running east-south-east, is met by another coming from the north-east, watered by the stream called by us Mañiuales on account of the large number of mañius in the forest; these coniferæ being so predominant and so close together in some places that not even the quila or colihue bushes are allowed to grow under their shade.

The Mañiuales valley is a succession of wide and narrow places, the current of the river being extremely strong in the latter, lacking all kinds of beaches. High snowy ranges are seen at either side running in the same direction as the valley; their continuity being broken by important tributary valleys, as those of the river Emperor William and Ñirehuau, the depressions of these running from east to west throughout the central masses of the Cordillera. The river Ñirehuau, in the upper valley of which there are already some settlers who have come from the Argentine side, has its sources near the continental divide in all the

stretch from the 45th parallel down to 45° 23′ S. lat. From Pico Katterfeld the divide runs over a tableland about 4200 feet high by a tolerably well-defined ridge, sloping eastwards towards Arroyo Verde and a sink basin called Laguna Coyet, similar to many others found in the country south of the 45th parallel. The tableland slopes gently to the east and falls steeply to the west, and the relative level of the valleys at both sides of the divide does not depart from the general rule mentioned before. The settlement called "Casa Richards" in the Ñirehuau valley is only 1700 feet above sea-level, while the Coyet lagoon is 2650 feet, and the lowest points of the divide on the border of the tableland vary between 2800 and 3650 feet.

The examination of a map of the Patagonian west coast shows that between the 41st and 45° 30′ parallels it is interrupted at more or less regular distances by long inlets of the sea, and the extension of these into hollow depressions of the territory, resulting in a certain regularity of conformation, even in the crossing of the principal masses of the Cordillera. As far as the 46th parallel we find the deep valley of the river Huemules, though the upper branches do not reach as far as the divide. Farther south we are confronted, however, by a different orohydrographical disposition of the ground, owing to the Cordillera forming to a larger extent a more coherent mass, the breaches and depressions of which are obstructed by enormous snow-fields and glaciers, that constitute a kind of "Inland ice," some 80 miles long and 30 miles wide, and their western outflow giving origin to huge tongues of ice that descend down to the sea-level or very little above it.

In the course of my last expedition in November and December, 1898, I travelled all along the coast southward of the 46th parallel; I crossed the Isthmus of Ofqui, pulling my boats over its glacial ground from Lake San Rafael to river San Tadeo, and went on exploring farther south, penetrating into various large inlets of the Gulf of Penas, until I sailed on the several branches of Baker channel, the largest of all the beautiful inlets in the Patagonian coast. Save in the case of the latter, where several valleys and rivers that shall be spoken of later on are discharged, there is only one place free from the icy barrier interposed between the end of these inlets and the hinterland; we refer to the Exploradores bay, about 46° 21′ S. lat., and its inland extension in a river valley that appears to penetrate far into the Cordillera. The exploration of this section has yet to be made, before it can be ascertained beyond doubt that the uninterrupted meridional chain of snow-covered Cordillera drawn in all the actual maps of the region between Mount San Valentin and San Clemente summits, has a real existence.

The low land barrier thrown across the otherwise continuous series of sea channels running between Taitao peninsula and the mainland, is

evidently the result of the accumulated deposits of former more powerful glaciers, of which the remains are only now to be seen in the three ice rivers that come down to the sea-level; the first, unknown before, it appears, descends into a small bay of the eastern coast of Elefantes inlet; the second being the famous San Rafael glacier, the icy tongue of which projects into the middle of the lake of that name; and the third and largest, with two branches, from which flow respectively the eastern streams that form river San Tadeo. Nothing grander could be conceived than the sight enjoyed by the eyes of the explorer in these places; nothing more striking than the contrast offered by the blue-white colour of the icy streams protruding from

RIVER PASCUA AND LAGOON (LOOKING NORTH).

large openings of the Cordillera, with the sombre hue of the rocks and cracks of the latter, the ashy green of the lake, and the deep green frame of the surrounding forests. The ice blocks that become detached at every moment from the front of the San Rafael glacier, float on the lake, and are carried through its river outlet to the neighbouring estuary. One thing that cannot but be noticed when going over the lowlands lying at the actual foot of those glaciers, or within their primary extension, is the enormous number of dead trees, remains of whole forests, usually of ciprés trees, which have very likely been destroyed by the invasion of those lands by melted ice. This fact seems to point to a receding movement in the terminus of some of these glaciers, such as

has also been observed at other parts of the Cordillera, especially on its eastern borders, where, on account of the lesser activity of the erosive forces, the moraine lines and other traces of ancient glaciers have been better preserved.

The Gulf of Penas is one of the most dreaded places of the Patagonian seas; even in calm weather, which seldom occurs, a heavy swell from the south-west breaks unceasingly against the precipitous flanks of the mountainous and bleak coast, and sometimes even the inner recesses of the fjords are vainly searched for a safe harbour. The crossing of the Cordillera is here a very difficult, if not an impossible undertaking, as the Gulf of Penas inlets do not lead to the access of any river navigable for boats, and even a march on foot would be stopped by the icy barriers standing at a few miles from the ends of the sea inlets. Swampy and flooded ground covered by forests of dead ciprés trees, or by the fearful entanglements of tepú bushes which take here the place of the quilantos, form the bottom of the depressions. Farther inland, a disorderly multitude of black peaks show their rocky heads out of the ice and snow-fields of the Cordillera, calling to mind the Greenland "Nunataks." The compacted snow-fields that feed the glaciers are, doubtlessly, very extensive, and we are inclined to believe that they form a continuous mass at the back of the coast ranges, and cover the slopes of the gigantic San Valentin massive and other dependent mountains.

Near the 48th parallel, the southern extremity of the Gulf of Penas is confined between some groups of high and rocky islands, which mark the meeting-place of two systems of sea channels intersecting at right angles: the first having as principal axis the Messier channel, and being extended without interruption as far as the western entrance of the Straits of Magellan; the other formed by the Baker channel, otherwise called "Estero Calen," and composed of two parallel arms extending some 30 miles inland in an easterly direction, and branching out further on in three inlets lying to the north, east, and east-south-east, the furthest eastern extremity being at some 55 miles from the channel entrance. Not far from the latter, two secondary inlets spread out, one to the north-east, the other to the south-east, very nearly interlocking, the first one with Boca-Canales inlet, and the second with a large fjord system, lying to the south of Baker channel, and explored for the first time by the Argentine boundary commissions. In my last expedition I crossed the low isthmus, only a little over 1000 feet long, between both systems, and found there a clear path for the conveyance of boats, no doubt frequented by the natives that happen to haunt those places.

It may here be said that in all the Patagonian coast already described there are actually no Indians or native settlements; and it seems that Baker channel is the northernmost part where this not always harmless

people extend their incursions, hunting for seals, that swarm on the detached rocks of the coast, or looking for shell-fish, which is their staple food. In past centuries this coast was inhabited, as is shown by the narratives by Don Antonio de Vea, Sir John Byron, and Father Garcia, who writes on his map the name of "Nación Calen" as that of the native inhabitants of the littoral to the south of Baker channel. In the journal of the voyage of Don Antonio de Vea there is frequent mention of Caucahue Indians, whose abode must have been also here or in the neighbourhood of Wellington Archipelago. There is no doubt that these Indians were always making excursions to the inlets and rivers of the coast, where their dwellings were seen by the aforesaid travellers; and it is not uninteresting to know that mention is also made of large numbers of dogs sharing company with the natives, this being in favour of the opinion that the dog was an aboriginal in these parts of South America. It is only in the present century that the natives have retired to the last recesses of the less frequented channels and estuaries of the southern extremity, but Captain Fitzroy saw, however, some of their wigwams on the coast of the Boca-Canales. In the course of our expedition to Baker valley we found traces of ancient conflagrations and some worked stones, unmistakable signs, in my opinion, that the attractive Cordilleran valleys at the hinterland of Baker channel, relatively easy of access from the sea-shore, have been inhabited, or at least visited, by natives. In connection with these remarks a certain interest is attached to an indication contained in the celebrated official Spanish map drawn by Cano y Olmedilla, where, at the place where the river Baker, or Las Heras, actually flows, a stream, called "Rio de los Caucahues Bravos," is traced as draining a lake labelled "Chelenco," perhaps the first information about Lake Buenos Aires.

As a result of explorations and surveys carried out either by Chile or by the Argentine Republic in the two last seasons, it has been ascertained that Lake Buenos Aires from the north, as well as Lake San Martin from the south, are drained through fluvial and lacustrine systems, more or less complex, towards Baker channel, so that this splendid fjord receives through the not very distant mouths of two rivers the largest part of the waters that fall on the vast Andine region between parallels 46° and 49° 20′—that is to say, more than three degrees of the meridian.

When I was going to start from Santiago de Chile in November, 1898, with the purpose of exploring the hydrographical basin drained to Baker channel, I had at hand no other positive information about that region than a short narrative and hydrographic chart showing the results of the first exploration and survey of Baker channel by Captain Rodriguez of the Chilean Navy effected in 1888. It was known, besides, that an Argentine commission had explored the upper course of the river draining Lake Buenos Aires, which they called

Rio Las Heras, and was supposed to be the same which another commission had reconnoitered in its lower course as emptying into Baker channel. The same supposition was also made respecting the drainage of another large lake discovered as well, simultaneously, by a Chilean and an Argentine commission in 47° 20′ S. lat., and called Cochrane by the former and Pueyrredon by the latter. An American naturalist, Mr. Hatcher, had also discovered, in 1897 (about 48° 30′ S. lat.), a large river running to the west, named by him River Mayer; and finally there was reliable information as to the Lake San Martin, hitherto shown on all maps as a tributary to the Santa Cruz basin, being also drained down to a fjord on the Pacific coast. I have deemed it necessary to make this explanation, so as to leave well-established the independence of the discoveries made by me and my fellow-travellers, Señor Michell, Count Schulenburg, and Mr. Hambleton, during our journey in 1898–99.

After a detailed survey of the several inlets and branches of Baker channel, I resolved to penetrate to the interior of the Cordillera by the valley of the largest river, the mouth of which we had found on the north-eastern coast, between the entrance of the northern and eastern inlets. This river, called by us Baker, which has been found to be the same named Las Heras in its upper course by the Argentine explorers, is doubtlessly the largest river in all Patagonia, as it should be, since it drains the largest of Patagonian lakes, Lake Buenos Aires, as well as Lake Cochrane, and receives the melting waters of numerous and extensive snowfields and glaciers of the Cordilleran ranges that lie at either side of its valley. We navigated this river with the boats for 43 miles, until we reached the foot of a fall, where the river, that down-stream is as much as a third of a mile wide, comes here rushing in a body between rock-walls some 60 feet apart from a height of 35 feet. Further up-stream the rapids do not allow the navigation for a stretch, after which it could be resumed for a very considerable distance, as the river widens again and comes down meandering through a large valley between forests and swampy plains.

The general direction of the valley and its bordering ranges is to the north-east for some 25 miles, and to the north-north-east for some 50 more, where it comes from the great depression of the south-western arm of Lake Buenos Aires. From the western side Baker river has, among other tributaries, the one which is called by us "Rio Ventisqueros," which runs from north-west through a large opening in the mountains bearing the glaciers which bar the way from the coast. By the eastern side it is joined by four large tributaries: two of them, rivers Ñadis and Salto, proceeding from the south-east through spacious valleys with tributary lakes branching up to the base of Mount Cochrane (Mount San Lorenzo of the Argentine maps), which rises 12,140 feet above sea-level. This powerful massive competes with Mounts San Valentin and

San Clemente as to which is the highest of Patagonia, and surpasses, with its white summit outflanked by dark, abrupt battlements, a whole group of little-known Cordilleran masses. At the foot of its eastern and south-eastern slopes several lakes lie that send in a southerly direction their drainage-channels as a tributary to the river Mayer, showing a marked analogy with the upper Futaleufú region as to its orohydrographical conformation, though the ground shows a difference as to the greater abundance of grass-covered land and lesser density of the forests. The valley is bordered to the east by a well-defined range, by the summits of which (more than 6500 feet high) the continental divide is effected in an extent of some 52 miles, shedding to the east the waters that form the rivers Belgrano and Lista, branches of Rio Chico flowing to the Atlantic.

A new feature in land-forms which appears to the south of the 46th parallel are high and extensive tablelands of neo-plutonic formation, emerging, so to say, from the buttresses of the Cordillera and unrolling eastwards into bleak desolate uplands with neither grass nor water, and only broken at long distances by "cañadones," more or less spacious valleys, sometimes dry and sometimes watered by streams of usually small importance. As a type of these tablelands, the one extending to the south of Lake Buenos Aires' eastern part may be mentioned; its width on either direction exceeds 35 miles, and its average altitude is not much under 5000 feet above the sea. Towards its western border there is a swelling of the plain that culminates in a group of snow-clad mountains, their summit, Mount Zeballos, rising above 9000 feet over the sea.

On the northern and southern sides of this high plateau are two profound depressions extending far to the west, and in their bottom lie respectively the Lakes Buenos Aires and Cochrane, the latter being drained by a copious, but short stream to the river Baker, which comes from the former. Both depressions are extended eastwards into the valleys of the river Deseado and river Jillo respectively, only the first of these being able to carry its waters through to the Atlantic. The divide at the highest points of both depressions only rises to 1640 feet and 1960 feet above the sea-level, these being the lowest stretches of the water-parting line in the austral region we are dealing with at present; while between both points this line crosses over the high tablelands before mentioned at a height above 5000 feet. Southwards of the Jillo depression the divide rises again up to 5250 feet, over a second rugged tableland furrowed eastwards by the headwaters of river Olni, a small, incomplete stream that sinks into salt marshes some way down the Pampa. This waste plateau is sometimes covered by snow already as early as from the end of the summer season. It is swelled westwards into a Cordilleran range culminating in Mount Belgrano (7870 feet), a point of the divide; this line runs from there halfway to Mount Cochrane,

where it meets the ridge confining the headwaters basin of river Mayer, and turns abruptly to the south, coming down again to about 3300 feet at a point separating the remotest sources of rivers Chico and Mayer.

The valley of the river Mayer's upper course appears to be one of the most valuable in Patagonia. The whole basin of this river, as well as Lake San Martin are, according to the last reports, drained to Baker channel. In our reconnoitering expedition to the south-eastern arm of this fjord we found at its eastern extremity a rather big river, the lower course of which runs among extensive alluvial deposits, where it is joined by another river originated by a neighbouring glacier. At the same time we found an inscription left a year before by an Argentine Commission, where their belief was stated, that this river came from a lake lying to the north-east. I ascertained, however, after a four days' excursion headwards into the valley, that, although the lake exists in the alleged situation, the main river proceeds from a narrow stretch of the valley extending southwards in an opening between snow-clad ranges. I formed then the opinion that this large river, called "De la Pascua" by us (river Toro by the Argentine party), the volume of which was an indication that it came from the divide, should be the lower course of the river Mayer. The upper course of the latter is, in fact, stated by its discoverer Mr. Hatcher to lie by 48° 30′ S. lat., that is to say, in the region from which the river Pascua apparently proceeds.* My supposition has been completed, I have recently seen, by the Argentine geographers, by the ulterior information that the river Mayer flows into Lake San Martin, the latter being drained to Baker channel by the river Pascua.

To conclude, I must call attention to the blanks that must still be filled to complete our knowledge of the Patagonian Cordillera between the 41st and 48th parallels.

In the first place, topographical surveys are lacking of these sections interposed between Cochamó and Puelo lower courses; between the latter and Lower Yelcho; the Claro hydrographic basin up to its supposed upper course, river Pico; and, finally, a long stretch of Cordillera between the Aisen lower course down to Baker channel's northern inlet.

In the second place, we are far from possessing a scientific know-

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* Recently I received the news that my fellow-traveller, Mr. Michell, from the Chilean Boundary Commission, resolved conclusively the hydrographical problem of river Pascua during his expedition carried out in the summer season of 1899 to 1900. Going up in the Pascua valley from the sea-shore for about 50 miles, he reached the origin of the river in a branch of Lake San Martin, the outlet of which lies in the neighbourhood of Mount Chalten.

ledge of this Cordillera, based on a minute examination of its intimate forms and its tectonic structural lines. We have as yet but detached pieces, so to say, of a geological mosaic work, gathered in the course of a few journeys through the Andine masses, all of which is barely sufficient to enable us to draw two or three sections or profiles at different latitudes. A good deal of information has been collected about the glacial phenomena which have taken place in former periods in those localities, and permits us to determine with a certain amount of accuracy the areas covered by such phenomena, and to form some idea as to their effect on land-sculpture. Still, this information is not enough, in my opinion, to allow the geological history of the Southern Andes to be attempted, or to settle, as has been rightly observed by one of the Argentine explorers,* the chronological order of the formation of the valleys, the genesis of the lakes, their partial desiccation, the capture of streams, the basaltic eruptions and the glacial phenomena. The expeditions which explore an unknown region have to attend first to the topographical surveys, and have seldom the opportunity to stay long enough at one place so as to give a proper time to the study of the physiography and geology of its surroundings. The difficulties imposed by the dense vegetation and the ruggedness of the rocks continuously worn out by weathering and erosion to the examination of the petrographical and stratigraphical features must be taken into account; as well as the inconvenience of the unavoidable and worrying method of transportation by carriers, that only allows the explorer to collect a very limited amount of specimens for ulterior study.

It cannot, then, be expected that these first pioneer expeditions should contribute except on a restricted scale to the knowledge of all the branches of natural history relative to the Patagonian Cordillera. But an improvement on the actual conditions will not be delayed for long. The clearing of paths and opening of roads, which are being actively pursued on the Chilean side, as well as the increasing number of settlers coming from the Argentine side to the subandine valleys, promise to scientific travellers the support and resources that they need for reaching the innermost recesses of the mountains, and so help to raise little by little the veil that still hangs over large tracts of this vast country.

Before the reading of the paper, the President made the following remarks: This evening we have to welcome here Dr. Steffen, who has been during the last ten years engaged in exploring the Patagonian Andes. He considers himself merely a pioneer, but when you have heard his paper, I think you will all come to the conclusion that he is a very thorough and good pioneer.

After the reading of the paper, the following discussion took place:—

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* See 'Revista del Museo de la Plata,' vol. ix. p. 249.

Prof. BERTRAND (Santiago University) said that, although he knew only the outside, so to say, of the intricate region into which Dr. Steffen had penetrated several times, he might perhaps offer a few remarks intended to resume the general conditions of the country, as well as to point out some important questions that arise with respect to the causes by which its land-forms have been produced. The first general fact that may be deduced from the account of the explorers, with regard to the conditions of travel, is that, though the country extends chiefly from north to south, the customary changes in climate correlative with the latitude are hardly perceptible, while those from east to west are most striking. For this, of course, the groups and chains of the Cordillera are mainly responsible, as the more westerly ranges act as a screen where nearly all the moisture and snow carried by the prevailing westerly winds are detained. The climate is also deeply influenced, undoubtedly, by the cold waters of the sea coming from the polar ocean, drawn northwards by the current noticeable along the Chilean coast. Turning to the aspect of the ground, we have heard to-night that on the littoral and amongst the western ranges of Cordilleras the rugged character of the country, due as well to the uplift of mountains as to the erosion of valleys, is most impressive, the dense forests contributing to increase the difficulties of travel, so that this can only be effected on foot. Further eastward, however, towards the region mentioned as *subandine*, the mountain slopes become less steep, the forest less dense, and the climate milder, as the winds, rains, and snowfalls, broken and spilt on the westerly ranges, are less and less frequent and severe. Among the questions that refer to the morphology of the land, the orography comes first. Though an attempt has been made to show in a sketch-map the extent and trend of such ranges of the Cordilleras as have been located by surveyors on the side of Chile, and more might be added from other sources, there is still a great amount of surveying and levelling to be done before sufficient material is collected to draw a contoured map that could be shown as a fair representation of the ground. Then come the geological questions: the petrographical constitution of the various mountains, the origin of the glacial and alluvial deposits, the relative ages of the actual parts, and the geological connections between them and those of the northern Cordillera. Finally, the very interesting question of land-sculpture may be mentioned. The conformity or non-conformity of actual river-valleys with former tectonic valleys has to be ascertained. It may be asked if the more important of these valleys are pre-existent to the powerful Cordilleran masses through which their course actually lie; how far has the erosion worked in a receding sense, and to what extent has the capture of streams at the headwaters of great rivers altered the primitive drainage areas. Explorations like those undertaken by Dr. Steffen are the first steps towards the answers to such queries. They form the best foundation for ulterior and detailed surveys such as those that both countries interested in the boundary are now carrying out, and the result of which will be at least a valuable contribution to the morphology of Patagonia.

After some remarks from Colonel Church, the PRESIDENT said: When I had the honour of addressing this Society for the first time as President, I alluded to the vast extent of unexplored country in different parts of the world, and I particularly mentioned these Patagonian Andes. At that very time the exploration which I wished for was commencing both on the Chilian and on the Argentine sides. Our old friend, Sir Woodbine Parrish, for so many years a member of the Council, communicated to us the interesting journal of Villarino, the old Spanish pilot of the Rio Negro, and eight years after we received a most interesting paper by Don Guillermo Cox, also communicated by Sir Woodbine Parrish, who was our referee for many years on all subjects connected with South America. Sir

Woodbine's successor in our present Council is Colonel Church, and most ably he fills that post. This evening he has nearly singed his wings on the burning question of arbitration. There can be no doubt whatever that when two countries do differ—although we are not allowed to refer to a political question here—on questions of boundary, it is an immense gain to geography. Atlases of the deepest interest and many volumes have been published in consequence of the arbitration between Venezuela and British Guiana, and we have no doubt a similar wealth of information will be derived from the arbitration between Chile and Argentina. Last year we listened to a most valuable paper, which was communicated to us by Dr. Moreno, from which we received much new information respecting the eastern slopes of the Patagonian Cordillera; and this evening I am quite sure you will pass a unanimous vote of thanks to Dr. Steffen, for having given us such an admirable description of the valley of the Puelo and the Baker or Las Heras river, taking up only two parts of the work of exploration with which he has been engaged; for I gather, from the beautiful slides which he has shown us of the scenery of that coast, that he has also explored the other rivers between the Puelo and the Gulf of Penas. I am sure you will all wish me to tell Dr. Steffen that you have passed a unanimous vote of thanks to him.

ANCIENT TRADING CENTRES OF THE PERSIAN GULF.

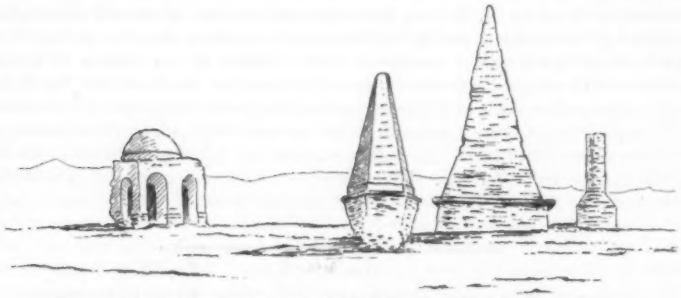
By Captain ARTHUR W. STIFFE, R.I.M.

VI. BANDAR 'ABBAS.

Some interest attaches to this place, as the first commercial settlement of the English in the Persian gulf, who established themselves here after the fall of Hormúz in 1622. It is still the principal port of Karmán and Lar, and its trade is much increased since it has been a port of call for the Gulf mail steamers. The anchorage is commodious and safe, and of convenient depth and good holding ground. It is protected from heavy sea by the islands of Hormúz, Larek, and Kesm (or at-Tawilah). Above thirty large transports and steamers were lying here in November, 1856, it being the rendezvous for the expedition which in that year captured Bushire. There is good anchorage for any number of ships off the place. The water is shoal off the town, 3 fathoms' water being about a mile off shore, and 4 fathoms about twice that distance. It would be very easy to build a long pier to land at, but all the work is done in boats, and except at high water landing is unpleasant, as you have to be carried some distance. It is often called only "Bandar."

It stands on the Persian coast in lat. 27° 10′ 29″, is fortified on the land side with a wall and round bastions, at the time of our visits very dilapidated, and contained then about 10,000 to 12,000 inhabitants, who mostly migrated during the hot weather. The land near is a great plain extending towards the foot of the great mountains 16 miles off in a northerly direction, which rise to a height of near 8000 feet. It is mostly uncultivated. The town has a frontage to the sea of near three-quarters of a mile, the only building of any pretension being the old Dutch factory, which is a large quadrangle, and fortified with a wall and towers. It was in fair repair, and used as the residence of the Chief. There are no date plantations near the town. The ruins of the British factory were pointed out some distance to the westward of the town, but little of it remains except the foundations. In the plain, about a quarter of a mile northward of the town, stands a group of tombs of the

European merchants (see sketch). These have been large and pretentious erections, after the fashion of those days, such as may be seen at Surat, etc. They are fast crumbling to ruin; the largest was about 30 feet high, many were mere mounds. No inscriptions could be found.* The place would become, under a civilized government, a place of considerable commercial importance, as it is advantageously situated for communication with the interior, and the whole eastern part of Persia. We were informed the caravans take twenty days from here to Karmán, and thirteen to Lar. The Governor is also ruler of the country adjacent. The



MAUSOLIA NEAR BANDAR 'ABBAS—THE HIGHEST ABOUT 30 FEET HIGH.

celebrated carpets of Karmán are exported from this place, also much sulphur from the mines at Khamír, which are worked in a rude, wasteful manner.

History.

It appears to have been at first merely a small fort erected by the Portuguese to protect their water-supply for Hormúz. It is called by Faria y Souza Comoran,† whence probably the old English name of Gombroon. Sir Thomas Herbert visited the place in 1627,‡ and gives the date of its erection as 1513. Captain Hamilton ('New Account,' etc.) says, "Gombroon had its appellation from the Portuguese in derision, because it was a good place for catching prawns or shrimps, which they call Camarong." Faria y Souza§ says it was taken from the Portuguese in 1614 by a Persian force of 14,000 men under the "captain" of Shiráz, after an ineffectual attempt in the previous year. It was only after its capture by the Persians that it received the name of Bandar Abbas, after the great king of Persia, who ousted the Portuguese from this place and Hormúz.

Pietro della Valle‖ arrived "at 'Combru,' called Port Abbassim since King Abbas took it from the Portuguese," in September, 1622. He says the streets and even the bazaar are narrow and small, and shops badly supplied. Without counting those left in Ormuz fort (which place had just been taken), there were here seventy or eighty pieces of ordnance, of which some had been given to the English; some

* These tombs, visited by J. B. Fraser in 1821, are described by him as then much in the same state as at present ('Narration of a Journey into Khorassan,' etc.).

† 'The Portuguese Asia.' Translated by Captain John Stevens. London, 1695.

‡ 'Some Years' Travels into Africa and Asia the Great.' London, 1677.

§ *Ante.*

‖ 'Travels of, into East India,' etc. London, 1665.

were large, nearly all made in the last five or six years, and marked with the arms and name of the King of Spain, weights of gun and shot, and charge of powder. On some were the names of the Viceroys. The fort, which he was not able to enter, was not that built by the Portuguese on the shore, but a new one, further inland, square, walls double but poor, no angles or outer defences except the inner wall, which had little round flanking towers, crenellated on top; the guns were mounted in a row, facing seawards, outside the gate. Our author next visited Hormúz in January, 1623.

In 1638, John Albert de Mandelsloe * arrived at Gambroon from Lar, very ill. He says, "it is not many years since it was a village, but since the reduction of Ormuz, the English, Dutch, and Indian ships have found out the conveniency of the harbour and trade. . . . The entrance of the haven is defended by two strong castles and a square redoubt, with some artillery. The houses are of burnt brick, with good mortar. The Sultan's palace and the warehouses where the English and Dutch are lodged are the houses of state." He refers to the great heat, and says, "there is no grass or plants except what is produced in some gardens with incredible labour. It is chiefly provided from Kischmisch (Kesm). The chief time for trading was from October to May, when the caravans arrive. The English pay no duties, but ought to get half the customs, but are forced to be content with about a tenth part. No Portuguese were allowed to come to Gombroon, which is the occasion they live in open hostility with the Persians, take their ships," etc.

John Nieuhoff † went from Vingorla to 'Gamron' in 1662. He describes it between two castles, and defended on the sea side by three stone bastions, on which are mounted good store of iron cannon; on the land side was only a stone wall much decayed. The houses had wind-towers, and were of sun-dried brick whitened outside with lime. There was scarcity of water, and he mentions good Persian wines. He also mentions the great heat, owing to mountains at the back, and says it was only habitable for Europeans from December to March. Once a year caravans trade to Schiraz et. Posts were very expeditious between Gamroon and Ispahan.

John Struys ‡ went from Lar to Gamron in March, 1672, "called Bendar," and describes it with two castles, built after the old manner, a reasonable strong wall towards the country, and without, has, at a convenient distance, several redoubts, also one on the coast. It has become a famous emporium frequented by Moors, English, French, and Hollanders. He speaks of the unhealthiness and great heat, "which is almost past after October."

Tavernier,§ in 1665, travelled from Shiraz *viâ* Lar to Bandar Abbassi, but does not say much except that the town was built with the ruins of Hormúz, and that "while the Portuguese kept Ormus, though they lived in the city, all the trade was at Bandar Abbassi, as being the most secure landing-place on all the coast."

Chardin ‖ visited Bandar Abbassi in 1674 and 1675; describes it as surrounded by walls on the land side, with two little forts, and 1400 or 1500 houses. The strand (quai), or sea-front, is more than a mile long. The houses of the French, English, and Hollander companies are the most commodious. The Governor's palace is in the part most distant from the sea, and built with stones and marble from Ormus. He mentions the wind-towers on the flat roofs, says it is only a

* Harris' Collection, 1744.

† Churchill's Collection, vol. ii. 1704.

‡ 'Voiages and travels of ——.' London, 1684.

§ 'Collection of travels of Tavernier . . . and other great men.' London, 1684.

‖ 'Voyages de Chev. Chardin en Perse.' 1735.

roadstead, and ships load quickly by boats (as they do at the present day), he says, of cocoanut wood (?) sewn together without any iron. He mentions the bad water and the large banyan tree, which attracted the attention and wonder of most travellers. It is still conspicuous, and stands some 3 miles east of the town, at a small village called Naband. He mentions that the English claim half the customs here, as the Portuguese the half at Congue. In 1675 news came to Ispahan from Congue that a Portuguese squadron had seized three native vessels with pilgrims to obtain their arrears of customs. They got tribute from even the smallest boats, and permitted no trade with India except in their own ships. They gave passports to ships under very stringent conditions and limitations.

Thevenot,* who went from Lar to Bender (-Abbassi) in 1684, says, it scarcely deserves the name of a good village. Half of the customs belong to the English, "but they receive not the fourth part, the Persians giving them but as little as they can." There is only "one public gate, a bazaar, and a small fort on the seaside, which chiefly consists in a square platform of about 4 fathoms each face, and some 2 fathoms high, with portholes for five or six pieces of cannon, but they have no more but two. The English and Dutch have each of them their houses, very well built by the seaside."

He did not proceed to India, as the Dutch could not take him, and there was danger from pirates.

Commodore Roggewein,† who sailed round the world in 1721–3, also refers to the multitude of pirates in those seas, mostly Europeans. He mentions the Dutch factory at Gambroon or Bender-abbassi, on the coast of Persia, where the director has an opportunity of making a vast fortune in a short time. The Dutch have by far the best factory, and have fortified it effectually. He also mentions an attack in 1701 by the Ballooches, with four thousand men, who were beaten off.

From Mr. F. C. Danvers'‡ report, I gather the following particulars regarding the English factory. There was some beginning of trade there shortly after the fall of Hormuz, and the agents agreed in 1631 to take from the king silk to the value of about £60,000 per annum, to be paid for one-third in money and two-thirds in goods. The rivalry of the Dutch seems to have been much felt, and the civil war in England also depressed the trade. In 1645 the company's property at Gombroon was all shipped to Basra for safety, so precarious was their position. Then follow intrigues, war with the Dutch, and negotiations, and fluctuations of trade of no great interest. In 1726, owing to the Afghan conquest of Persia, trade greatly declined. The factory at Bandar Abbas was under the Ispahan agency until 1750, when the latter was finally closed and the English retired to Gombroon. The end was not far off. In 1756 advice was received at Gombroon of war having been declared against France. On October 12, 1759, a French squadron of four vessels (one of seventy-four guns), under Comte d'Estaing, entered the roads of Gombroon, and on the following day they landed to the westward of the factory with two mortars and four pieces of cannon, and commenced an attack on the place, in which the vessels joined. The factory was in no position to defend itself against such odds, so the chief and council agreed to a capitulation, under which the factory and all its contents, including a large sum of money, were to be handed over to the French. The agency retired to the Dutch factory. The French, before withdrawing to their ships, set fire to the factory, in which they had placed explosives to ensure its complete destruction. They also burnt the company's ship *Speedwell*.

* 'The travels of M. de —— into the Levant.' Newly done out of French. London, 1687.

† Kerr's collection, vol. ii.

‡ 'Report on the India Office Records relating to Persia,' etc.

After the retirement of the French, the people of the country completed the destruction of the factory.

A temporary establishment was kept on until 1763, when the agency was removed to Bushire, owing to the unsettled state of the country. In 1770 the agency was temporarily re-established, under orders from the Court of Directors, but was soon abandoned.

The Maskat Arabs occupied the place for near one hundred years, but were dispossessed by the Persians in 1854, after a siege. They appear to have paid some tribute to Persia, in acknowledgment of her over-lordship.

DR. JOVAN CVIJIĆ'S RESEARCHES IN MACEDONIA AND SOUTHERN ALBANIA.*

A PRELIMINARY communication made by Dr. Cvijić to the Proceedings of the Hungarian Geographical Society enables us to supplement the short account of the Professor's work in the Balkan peninsula which appeared in the April number of the *Journal* (vol. xv. p. 417).

Prof. Cvijić made his first journey in Macedonia without the advantage of special recommendation on the part of the Sublime Porte, and on that account was not always free to carry out his scientific labours at will. Travelling the next year with an open order to the Valis of Salonica and Monastir, supplied by the Ministry of the Interior, he met with nothing but courtesy from the authorities, being often received with the oriental politeness shown to one recommended as friend ("dost") by the higher powers. This dignified courtesy and the open character of the Turks permit a traveller with such credentials and possessed of any degree of tact to pass through Turkey without any unpleasant experiences so far as the Turks themselves are concerned. The Arnauts of Northern Albania—small clans known by the general designation of "Gheg"—are, on the contrary, quick to anger and suspicious. They must be treated with deference and bound by the well-known "Bessa"—their pledged word—which forms, in fact, in conjunction with the vendetta, the sole guarantee of public security. With this aid, however, travel is possible even in Northern Albania. The southern Arnauts, known as the Torkas, are totally different in character. They have been to some extent civilized by Greek influence, and have retained the chivalrous qualities of a race of mountaineers while apparently losing the less estimable traits. At all events, Dr. Cvijić draws a picture of their hospitable manners, which presents them in a most amiable light. The Slavs of Macedonia, who consider themselves as either Serbs or Bulgarians, were found by the traveller to be very distinct in character from the other Slavs of the Balkan peninsula. Their national feeling is less strongly developed than is the case with the rest of the southern branch of the race; they are industrious and frugal—even grasping. Yet there are marked exceptions which seem to prove that these qualities are not natural to them, but have been acquired under the stress of circumstances. The traveller needs to show prudence and determination in his dealings with them.

The Macedonian towns possess an old form of civilization, which presents few attractions to Europeans; still cleanliness is not a rarity, especially among the Christians. The monasteries, however, abound in dirt, and likewise the villages, so that, when spending the night at them, Dr. Cvijić was usually compelled to

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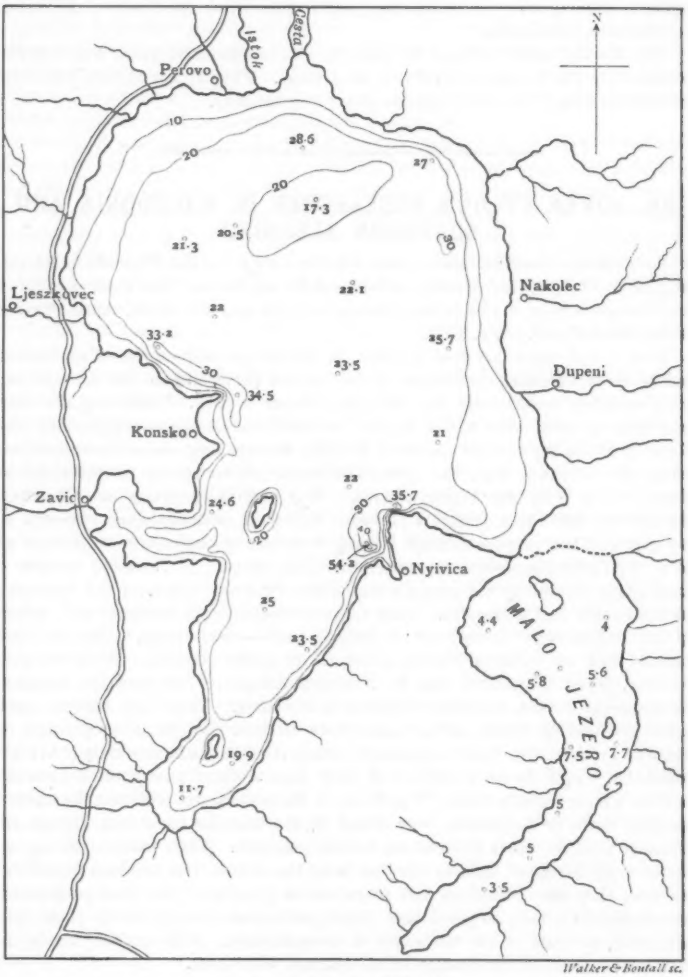
* Communicated by Dr. K. Peucker, of Vienna.

bivouac in the open. Macedonia is poor, and may rank with Southern Greece as the poorest land in the Balkan peninsula. Of small fertility, extensively disforested, and without particularly good pasture land, the country cannot support

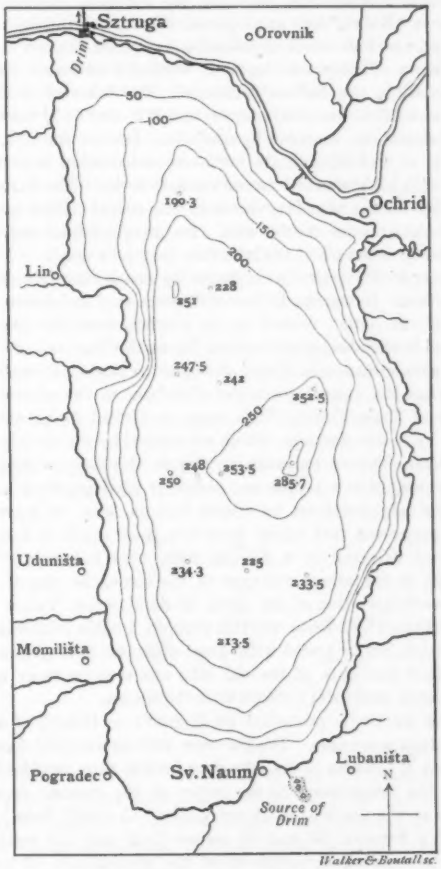


LAKE PRESPA, 1: 250,000.

its relatively numerous population, and therefore an important branch of occupation with the Macedonians is the taking service in foreign countries—"Pečalba," as it is called. Many thus become well-to-do and civilized.

The necessity of carrying with him even the supply of food for the journey

renders the scientific traveller's impedimenta—bulky enough under ordinary circumstances—more than usually cumbersome in these countries, European though they be. An escort is needed of one or two unmounted (Zaptiyes) or mounted gendarmes (Suvariyes), and a cavass or armed attendant, generally an Arnaut, without whom the traveller would be put down as a "fukara" (one of the rabble)



LAKE OCHRID, 1: 250,000.

On his recent journey Prof. Cvijić had with him one of his pupils and a personal servant, so that his party consisted in all of eight to ten persons, who were accompanied by five or six horses.

In 1898, Prof. Cvijić had explored, first the neighbourhood of Salonica, afterwards the basins of Serres and Dojran. He found the mountains of this region (Bešik, Prnar or Kušnica, Menikejske gore, Bozdag, Kruš\, and Belašica) to consist either

of granite and the older crystalline schists, or of phyllites and crystalline limestone. They are block-systems, formed by recent fractures, while between them lie areas of depression—the basins of Macedonia. That of Serres contains three large lakes, in their present condition of recent age. Two of them, Tachinos and Butkovo, are swamps and peat-bogs with a maximum depth of only 6 to 7 feet, whereas the Dojran lake reaches depths of 20 metres (65 feet). Several mountains were ascended in Western Macedonia, including the Peristeri, on which the discovery was made of three "Kahre," two small glacial lakes (at elevations of 7220 and 7280 feet respectively), and four small moraine-banks, which descend to a level of 6200 feet (1890 metres). These are the most southerly traces of former glaciation hitherto discovered in the Balkan peninsula. The lakes of Ochrid and Prespa, lying at altitudes of 2260 feet (690 metres) and 2790 feet (850 metres) respectively, occupy areas of depression, bounded by meridional lines of fracture. A rift follows the eastern side of Ochrid, and its northern continuation is marked by a series of conical hills with solfataras and recent volcanic rocks. The basin of Prespa with its two lakes lies on the boundary between the recent folded mountains in the west and the ancient masses in the east. Its marginal fractures are recognizable even in the tectonic structure of the lake floor (compare map).

In the summer of 1899, Dr. Cvijić began by examining Lake Amatovo, in the lower Vardar valley. Lying in a hollow of Pliocene sand and detritus, it constitutes a valley-lake without outlet, formed by an overflow from the Dojran lake. The dry river-channel is still distinguishable as far as the Vardar. Proceeding up the valley of the latter stream, Dr. Cvijić diverged to the south-west near Köprülü (Veles), and visited the antimonite mines of Rožden in the otherwise uninhabited mountain-range of Nuže-Kužuf. This range is formed by an ancient system of folds, traversed by newer fractures, which are marked by the abundance of trachytes and trachyte-tufas. Thence he made his way to the basin of Meglen, the garden of Macedonia, where, with a proper succession of sowings, three harvests ripen in the year. In this neighbourhood he visited Vodena, with its travertine waterfalls and deposits of calcareous tufa which have not their equal in Europe, and passed along the ancient *déversoir* of a diluvial lake, here followed by the Salonica-Monastir railway, to the largest remnant of the same, the lake of Ostrovo, which occupies the lowest depression of the basin of Saridjol (the Yellow lake). During the glacial period the whole basin was still occupied by this Yellow lake, the gradual desiccation of which can be traced with great clearness in a system of terraces and shore-lines. Other remnants of the old lake are seen in three smaller pieces of water. The present outflow of Ostrovo is subterranean.

From Ostrovo Dr. Cvijić proceeded by Monastir to Ochrid, of which a detailed survey by soundings was made. Depths over 200 metres (656 feet) occupy much more than a third of the area of the lake-floor, which thus has the form of a steep-sided trough. The temperature of the water at the greatest depth was 5·5° C. (42° Fahr.), and at the surface, in August, 21·4° C. (70½° Fahr.), the maximum gradient occurring between 30 and 35 metres (100 and 115 feet). The lake is further marked by a strong development of the phenomenon of the "Seiche," or occasional variation in level of the surface (due to strong winds), such as was first proved to exist on the lake of Geneva by Prof. Forel. Small depressions occur in places on the lake-floor, resembling the Boubioz of the Lake of Annecy, the existence of which was determined by Delebecque. The lake derives the greater part of its transparent water from springs, which occur in holes and clefts along the southern limestone coast. The most copious is that known as the Drim source, south-east of the monastery of Saint Naum; but those which rise from rifts to the south-west of that monastery, over a hundred in number, supply together fifteen to twenty

times more water than the first-named spring. Others again occur beneath the water of the lake. All are subterranean outflows from the Lake of Prespa, a fact which Dr. Cvijić was able to prove by a thorough examination of the Karst region between the two lakes.

The basin of Lake Prespa contains two lakes, Prespa and the Malo-Jezero (the little lake), which, on existing maps, is wrongly designated as Ventrok or Drenovo. Ventrok (not Ventrok) is merely the name of the subterraneous outlet from the south-west end of the Malo-Jezero to the Devol. That lake lies at the present day at a level of 16 to 20 feet higher than Lake Prespa, into which it discharges directly. During the glacial epoch it still formed a deep bay of the larger lake. The latter receives its most numerous tributaries from the Peristeri range in the north-east, but principally from the north. It discharges its waters subterraneously to Lake Ochrida (and thus to the Drim), and also to the Devol. Hydrographically, therefore, the lake is a basin of bifurcation. The floor of the lake is broken near the margin by two channels, the result of structural disturbances (cf. map), that in the west having a maximum depth of 34·5 metres (113 feet), that on the east one of 54 metres (177 feet). The greater part of the basin consists of nearly level ground, with a depth below water-level of little more than 20 metres (60–70 feet). Both Ochrida and Prespa are old lakes, which since younger Tertiary times have been subject to fluctuations of level, evidences of which can be traced with precision along the shore-line at the present day.

After sounding the small lake of Kastoria, south-east of the Prespa basin, Dr. Cvijić concluded his last year's journey in Macedonia with an excursion into the Nice range. As a result of his researches, the most important limnological problem which awaited solution on European ground may be regarded as cleared up in its broad outlines.

The following table gives some of the limnometric values communicated by the author or obtained provisionally from the material now available:—

	Height above sea in feet.	No. of soundings.	Area. Sq. miles.	Maximum depth. Feet.	Mean depth. Feet.
Amatovo	—	—	circ. 6·6	circ. 8	—
Dojran	530	—	—	circ. 66	—
Ostrovo	1730	—	circ. 30	200	—
Malo Jezero	2810	circ. 80	21	25	circ. 13
Prespa	2790	circ. 250	115	177	circ. 60
Ochrid	2260	circ. 190	107	938	circ. 480

Ochrid, with its area of 277 * square kilometres (107 square miles), contains over seven times more water than Prespa, which, with an area of 298 square kilometres (115 square miles), is 8 per cent. larger; and probably not much less than the Lake of Constance, though only half the size of the latter.

NOTE.—The accompanying sketch-maps are based on the maps given in the *Mitteilungen* of the Royal Hungarian Geographical Society, with additions from the original drawings kindly placed at the disposal of the writer of the present article by the author.

* Obtained by measurement with the planimeter on the original drawing.

THE MONTHLY RECORD.

EUROPE.

The Food-supply of the United Kingdom.—A careful study of the question of the food-supply of the United Kingdom, leading to results somewhat at variance with ideas entertained on the subject in some quarters, is contributed to the *Journal of the Royal Agricultural Society* (March 31, 1900) by Mr. R. F. Crawford. The writer begins by estimating the amounts produced at home and imported from abroad of the four fundamental articles of food—wheat, meat, potatoes, and milk—for all these must, he holds, be considered in the study of the problem. The results obtained show that the home contribution is, in the case of wheat, less than 25 per cent. of the whole consumption; of meat, as regards which the state of things is much more satisfactory, about 62 per cent.; of milk (including butter and cheese), about 55 per cent.; and of potatoes, practically the whole. But even these figures are too favourable, for the live stock reared in this country has largely to depend on food-stuffs grown abroad. In view of the difficulty of obtaining the value of these in their converted form, Mr. Crawford attempts to calculate the acreage that would be necessary to produce an equal amount of such food-stuffs at home, finally adding this to the area required to produce an equivalent of the imported supplies of wheat, meat, and milk. The total number of acres so obtained is 22,999,000, this being considered a distinctly moderate estimate. Therefore, as the area now under crops and grass is 47,800,000 acres, it is clear that we could not, as has been thought possible by some, add to our productive surface anything approaching the area represented by the imports of wheat, meat, and milk. On the other hand, the law of diminishing returns precludes the possibility of any large increase of productivity through radical changes in methods of farming, etc. At the end of his paper, Mr. Crawford compares the state of agriculture in the United Kingdom with that prevailing in Belgium, Germany, and France, showing that there is no foundation for the idea that the first-named is able nearly to feed her people from her own soil; and that, judged from the standpoint of productivity, the system of farming in this country is, if anything, superior to that of Belgium, and far ahead of those of France and Germany. This holds good both in respect of the acreage required to feed a given number of persons, and still more in respect of the amount produced per agricultural worker.

Marine Economy of the German Coasts.—Dr. P. Langhans, who has paid much attention to the cartographical representation of German economic statistics, contributes to the fifth number of *Petermanns Mitteilungen* a sketch of the economic relations of the German coast-lands to the sea, with accompanying maps. The shipping statistics of the German ports, shown by symbols on the general map, and, in the case of the most important ports, on special insets, are grouped in the text under the headings "North sea" and "Baltic." Out of a total registered tonnage of 37,786,000 (or 35,517,000 after deducting the amount representing ships calling at intermediate ports during the course of the voyage), 64·9 per cent. falls to the North sea, and 35·1 to the Baltic, Hamburg alone being accountable for 38·5 per cent. of the former. As regards accommodation, etc., for shipping, the two regions are on more even terms, the North sea ports showing a slight numerical superiority as regards wharfs and docks, and those of the Baltic as regards shipbuilding yards, to the number of which Kiel, the Stettin district, Danzig, and Elbing all contribute a larger share than any North sea port except Hamburg. On the other hand, the Elbe and Weser ports own 83·6 per cent. of German shipping, and Hamburg and Bremen together 72·6 per cent. The fishing industry is

considered firstly in reference to the percentage of the total population engaged on it in the separate "circles," and next in respect of the number of vessels employed at different portions of the coast. A special map shows the distribution of the fishing population, and brings out clearly the high percentages which occur in the circles with a large development of coast-line, such as Rügen, Usedom-Wollin, and the several "Nehrungen." Others, which occur here and there, are to be explained by the presence of special factors, such as the inclusion of a fishing port. The distribution of the industry is not completely brought out by such percentages, for the important modern deep-sea fisheries which have their headquarters on the lower Elbe, Weser, and Ems are entirely overlooked by this method, owing to the general density of the population in those districts, by which the finishing element is swamped. They employ a larger class of vessel than the Baltic coast districts, which latter possess only five registered fishing steamers as against a total of 129 on the North sea. In regard to the number of unregistered vessels, the bulk of which are undecked boats, the Baltic, and especially the coasts of Pomerania and East Prussia, far outstrips the North sea.

The Railways of Austria.*—At the end of 1898 the total length of the Austrian railways amounted to 18,095 kiloms. (11,236 miles), showing an increase as compared with the preceding year of 845 kiloms. (525 miles), or 4·9 per cent. Of that total 7521 kiloms. (4670 miles) fell under the head of state railways, and 10,574 kiloms. (6566 miles) under that of private lines, 2675 kiloms. (1660 miles) of the latter being, however, worked by the State. The total length of lines so worked had therefore risen by the end of 1898 to 10,142 kiloms. (6300 miles), an increase of 7·4 per cent. as compared with 1897. Characteristic of the nature of the country is the fact that full 79 per cent. of the total length represents lines running at a gradient as against 21 per cent. running on level ground; while curves account for 38 per cent., to 62 per cent. of straight lines. The number of passengers carried in 1898 was 126 millions, the number of passenger-kilometres amounting to 4439 millions. The opening of the Vienna city railway was one of the causes of the large increase of the passenger traffic, which amounted to 15·2 per cent. (State railways, 26·8 per cent.; privately worked railways, 7·4 per cent.). The increase per kilometre of lines open was 11·6 per cent. (21 and 5·9 per cent. in the respective categories). Goods were carried to the extent of 110,981 million tons (37,565 millions falling to State railways), the increase as compared with 1897 being 6·4 per cent. (State railways, 10·4 per cent.), and expressed in ton-kilometres 9·6 per cent. The total number of accidents was 1626, and that of injured passengers 143, eight cases being fatal. There was, therefore, one death to each 20 million passenger-kilometres.

Official Map of Turkey.—In the summer of 1899 was published the first and larger instalment of the map of European Turkey, corrected, as we learn from the title, by the Turkish general staff, and printed in the fifth section of the Ministry of War in the year 1317 (1899). The portion which has appeared consists of forty-four sheets, while the whole will be complete in sixty-four. In the north it includes Eastern Rumelia, Southern Bulgaria with the neighbourhood of Sofia, the south of Servia, and the east of Montenegro. The parts not yet issued comprise the Turkish peninsulas and the country south of the Macedonian lakes up to the Greek frontier. The map is a revised edition of that published in the eighties by the general staff on the scale of 1 : 300,000, this being now enlarged to that of 1 : 210,000. According to the statements of the Military Geographical Institute of Vienna, the older map was little more than a direct reproduction of the general

* Cf. "The Railways of Hungary," *Journal*, vol. xv. p. 533.

map published by the institute on a similar scale, while even the new Turkish map is based, so far as the western parts are concerned, on the Austrian. For the eastern parts the basis is supplied by the Russian 5-verst map, from which the new scale is derived. Much valuable original material has, however, been embodied in the portion concerned with Albania, Macedonia, and especially the neighbourhood of Constantinople. The relief is shown in brown, by contour-lines drawn at intervals of 50 metres, the respective altitudes being marked. The nomenclature is for the most part given in Turkish cursive characters (Rika), but in the eastern sheets this is often replaced by the more legible alphabet of Fuad Pasha. The translation of non-Turkish names is an arbitrary one, whereas the national Turkish nomenclature is reproduced with great clearness. In spite of some defects, the map is to be welcomed as a useful contribution to the extension of our knowledge of the European *terra incognita*.

The Kosovo Vilayet, North-West Turkey.—Dr. Karl Oestreich has lately contributed to the *Abhandlungen* of the Vienna Geographical Society (1900, pts. 4 and 5) a sketch of the geography of the Kosovo Vilayet, which was the scene of his explorations in the autumn of 1898. The journey itself, of which an outline was given in the *Journal* for March, 1899 (p. 301), was fully described in the *Verhandlungen* of the Berlin Geographical Society last year. Dr. Oestreich begins by pointing out that the district in question cannot appropriately be designated by a single name, as it forms a borderland both ethnologically and politically, and at the same time geographically. Although the gathering-ground of many of the rivers of Western Turkey, it does not, taken as a whole, form an upland region, its central feature being the twin plains of the Metojia and of the Kosovo Polje, with the hills which separate them. The first of these plains—the wider of the two—is the collecting-ground for the waters of the White Drin, which breaks through the mountain rim at the southern end of the plain. The second plain, which has more of the form of a valley, sends its waters to the north to the Morava system, and south to that of the Lepenac (tributary of the Vardar), its highest part forming a swampy water-parting. Towards the south this central region is bounded by the plateau of Kacanik, cut by the narrow winding valley of the Lepenac, and formed in the east by the Kara Dagh, and in the west by the Šar Planina, the culminating ridge of the whole country. To the west and north the Metojia is limited by the North Albanian alps, which form the edge of an extensive upland with an average elevation of over 3000 feet. To the east the Kosovo Polje (known also as the Amselfeld) is bounded by a mountainous country rising to a height of 4300 feet, and further north, in the Kopaonik range, to one of 6500 feet. The focus of the political and economic life of the region is Üsküb, the chief town of the Kosovo Vilayet, which owes its importance to its position commanding the chief lines of communication through the country. Besides being about midway on the railway from Nisch to Salonika, it is also the junction for the Mitrovica branch which traverses the Kosovo Polje. To the north-west alone is communication blocked by the Šar Planina, which is crossed by no road or track passable for wheeled traffic. It is this isolation of the Drin basin which has favoured the exclusive character of its inhabitants. Dr. Oestreich describes in turn the principal physical divisions of the country, devoting special attention to the Šar Planina and its bordering heights on the side of Üsküb.

ASIA.

Bogdanovich's Expedition in North-Eastern Siberia.—The May number of *Petermanns Mitteilungen* contains an account by General Krahmer of the geographical results of Bogdanovich's Okhotsk-Kamchatka expedition, as recorded in a recent paper in the *Izvestia* of the Russian Geographical Society

From Nikolaievsk on the Amur the Russian traveller made the whole circuit of the Sea of Okhotsk, studying the geology and orography of the coast-lands. The district between Nikolaievsk and Okhotsk falls orographically into two distinct subdivisions—the region of the Ud in the south, stretching northwards to Chumukan, and a section of the Stanovoi system in the north. In the former we find a series of more or less parallel ridges running towards the sea and separated by broad swampy valleys, their ends being quite unconnected. They are spurs of the mountain system known as the Little Khingan, which supplies the water to the lower part of the Amur basin, but, owing to the extent of swamp, the district has no specially marked mountainous character. The range north of Chumukan, known here as Jugjur (4000 to 5000 feet), is the immediate continuation of the water-parting between the Amur and Lena, and itself separates the waters of the Arctic ocean and the sea of Okhotsk. The character of the two versants is distinct, the eastern side being characterized by separate ridges, while on the west a wide plateau extends towards the Lena. Near Okhotsk groups of table-topped hills take the place of continuous ranges, while beyond that place the Stanovoi takes the form of a broad chain with separate ridges. The character of the coast-lines of the Sea of Okhotsk varies with the mountain structure, and with the varying angle which they make with the tectonic lines. Evidences of a retreat of the sea, which has been in progress throughout the recent geologic epoch, and has been continued down to the present time, are everywhere visible. Kamchatka is divided by its water-parting—which is at the same time the axis of the peninsula, around which all its features are grouped—into two parts, known to the inhabitants as the west and east coasts. The profile of the central ridge, of which the mean height is 4000 to 5000 feet, is very irregular, its forms being due in parts, especially in the north, to extensive volcanic outflows, and in others to the elevation of single volcanoes, which are more numerous to the south. The western coast-lands generally rise from the sea at a low angle, and are traversed by broad swampy valleys, between which the ground is covered with birch-clad mounds and banks. A large part of the east coast is taken up with ranges and volcanoes belonging to the system of the central chain, but towards the north this is bordered on the east by an open plateau about 1500 feet above the sea, from which it is separated by a narrow strip of lowland similar in character to that on the west coast. With its rocky mountain crests, slopes covered with dense thickets, and poplar woods along the streams, Kamchatka presents a varied landscape. Rocky tundras such as occur in the Stanovoi region are comparatively rare, moist grassy tundras with hillocky surface being more common. Glaciers were discovered on the upper course of the Tigil, where they had not been known to exist. They are not of great size, but have well-developed moraines, and belong to the type of hanging glaciers. The valley below presents a typical glacier landscape. Glaciers also occur on one or two of the extinct volcanoes. The low elevation of the ends of the Tigil glaciers makes it surprising that more of the central chain is not glaciated, but this is perhaps to be explained by the relative position of the ridges and the direction of the prevailing winds.

Two New Russian Railways.—Two railways of great importance are to be opened this month for traffic in the Russian dominions in Asia. One of them is the Transbaikalian branch of the Siberian railway, now ready between Irkutsk and Sryétensk, on the Shilka. This railway runs 40 miles from Irkutsk to the station "Baikal" on Lake Baikal. There the train is placed on a steam-ferry, which is at the same time a powerful ice-breaker, and is transported to the Mysovskáya station, on the eastern shore of the lake. Then the railway follows the usual highway; that is, it passes through Verkhneudinsk (whence the high-road branches to

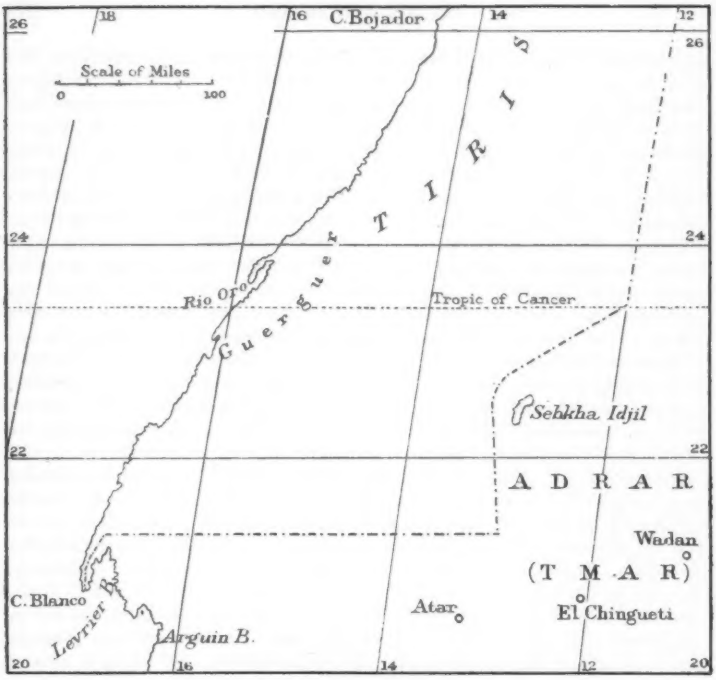
Kiákhta, Urga, Kalgan, and Pekin); then it crosses the Udinsk high plain, slowly reaching a low pass across the Stanovói, or rather the Yáblonovoi Khrebét, where the line reaches, down a rapid slope, Chitá, the capital of Transbaikalia, situated on the Ingodá, tributary of the Shílka. Some 20 miles lower down on the Ingodá stands Kaidalóvo village, where begins the great Trans-Manchurian line running through Chindánt, Tsurukhàitu, Tsitsikar, and Mukden, to Vladivostok and Port Arthur. Further on, on the Ingodá, is Nérchinsk (the town, not the mines, which are further east, on the Argun, near the Chinese frontier), and after a course of 240 miles from Chitá, the railway reaches Sryétensk. This spot, which was a tiny village some twenty years ago, is now a rising town where the steamers are docked for the winter, and where large mechanical works have been established lately. The Shilka is there already a beautiful large river, navigable for steamers having not more than 3 to 4 feet draught. From Sryétensk to Khabarovsk, which is the head of the Usuri-Vladivostok railway, the distance along the Amur is, however, still 1300 miles, and the river is under ice from October 15 till the beginning of May. The Caucasian railway is perhaps even more important. Up to the present time, Transcaucasia, *i.e.* the governments of Tiflis, Kutais, Baku, Kars, Batum, and Erivan, were not connected with the Russian railway net. The Caucasian railway, beginning at Rostóff on the Don, went south-westwards across North Caucasia to Vladikavkáz, and to the watering towns around Pyatigórsk; but it stopped there. The Caucasus range was only crossed by rail at its western extremity by a line branching from the main line south-westwards, *viâ* Ekaterinodár, to Novorossiysk on the Black sea. From this port to Poti and Batum, the communication had to be made by steamers. A line of railway beginning at Batum and Poti, crossing the Suram mountains by a tunnel (lately completed), ran along the southern foot of the great Caucasus range to Tiflis, Elisabethpol, and Baku, on the Caspian sea (599 miles); and a branch line of some strategic importance was being built from Tiflis south-westwards to Alexandrapol and Kars. But the Transcaucasian railway was not connected with the North-Caucasian line, and from Vladikavkaz one had to go to Tiflis by means of post-horses through the most picturesque gorge of the Darial. This journey cost 54 roubles in a separate carriage, and from 19 roubles to 5 roubles 40 copecks in an omnibus, while the railway ticket from St. Petersburg to Vladikavkaz costs only 36 roubles 50 copecks in the first-class, and 14 roubles 60 copecks in the third. Now the Transcaucasian railways are connected with the North-Caucasian lines *viâ* Baku. The route is, of course, a very circuitous one, as the main Caucasus range is not crossed, but only turned at its south-eastern extremity along the Caspian shore. It covers 802 miles, instead of the 120 miles which separate Vladikavkaz from Tiflis; and yet the journey from St. Petersburg to Tiflis on that circuitous route will only cost 49 roubles 50 copecks in the first class, and 19 roubles 80 copecks in the third. The new railway branches from the main line at Beslan, 13 miles before reaching Vladikavkaz; then it passes through the fort Grózüyi on the Terek, and reaches the Caspian sea at Petrovsk (180 miles). It runs next for 284 miles close to the shore of the Caspian, through the Derbent gate, to the Balajáry station, 3 miles before reaching Baku, where one has to retrace his steps westwards for 338 miles, along the southern foot of the Caucasus, up the valley of the Kura, in order to reach Tiflis. At any rate, the whole journey from St. Petersburg to Tiflis (2407 miles) can now be made in a railway carriage at a relatively very small cost.

AFRICA.

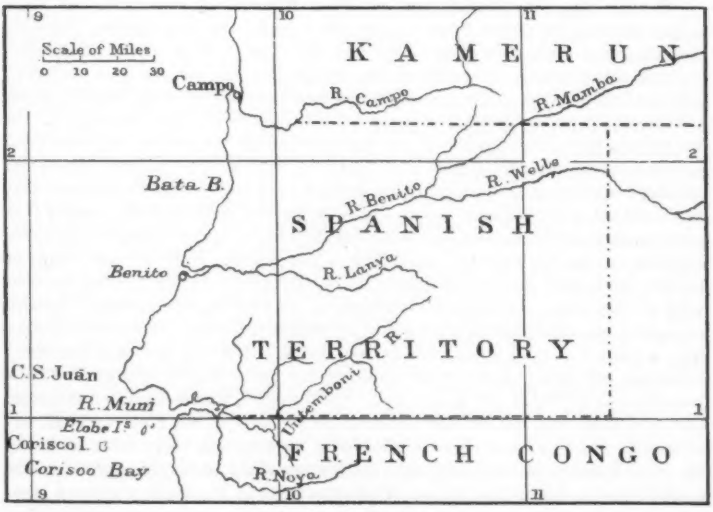
M. Flamand's Scientific Mission to the Tuat Oases.—In the 5th number of *La Géographie*, M. Flamand, leader of the mission despatched last winter under Government auspices to the Tuat oases, gives a summary of the work

accomplished in the various departments of science with which his researches were concerned, which shows that considerable additions to our knowledge of that region have been made. Especial attention was paid to the fixing of geographical positions by astronomical observations, particularly that of Insalah, about which so much discussion has taken place. For the determination of levels, M. Flamand took with him two mercurial barometers, which he took to Insalah and back without accident, thus obtaining results of value as being comparable with previous determinations by the same methods. Observations were made daily at fixed hours at stations on the route, and at the same hours, with identical instruments and under similar conditions, at Tuggurt, Wargla, El Golea, and Ghardaia, stations of the meteorological department. A complete series of meteorological observations was also obtained. Studies of the morphology of the region were made, and light thrown on the *régime* of the weds Igharghar and Niya, and on the composition and influence on the hydrography of the *hammada*, or Cretaceous and Tertiary plateaux of the higher and lower Sahara. Although no great extent of *areg* was traversed, enough dunes were seen to permit the elucidation of all the phases in the formation of an *erg*. Geological researches were carried out in the Tertiary and Pleistocene formations of the Saharan basins, in the Cretaceous of the Tademait, and in the sandstones of the primary series north of Meguiden. In connection with the applied hydrology of the region, a special study was made of the supply of water to the oases by means of *feggaguir*, or underground galleries. Interesting information was also collected as to the mutual relations of the different sections of the population. It was found that, far from being a source of supply to the Tuareg, the Tuat archipelago—such is the collective name applied by M. Flamand to the oases of Gurara, Tuat proper, and Tidikelt—depended upon the latter, at least in the eastern part, for many of the prime necessaries of life, which are given in exchange for the dates of the oases. The inhabitants of the latter, in case of attack by the Tuareg, retire with their flocks to their *kasba*, behind the walls of which they find sufficient protection.

Franco-Spanish Boundaries in West Africa.—A convention has been signed between France and Spain for the settlement of the long-standing questions respecting the mutual frontiers of the two countries in West Africa (see accompanying sketch-maps). The text of the arrangement has not yet been published, but the details given in the French papers make known the broad results, which are also shown on sketch-maps published in the *Dépêche Coloniale* for July 4. In the Sahara, where the frontiers of the respective territories on the coast were fixed by the agreement of 1890 (which gave Spain the section between Capes Blanco and Bojador), the difficulties as regards the interior have been settled in the sense that Spain abandons her claims to Adrar, the boundary-line bending to the west of that country, and likewise leaving to France the Sebkha, or dry salt lake, of Ijil, which supplies salt to the caravans proceeding to the Sudan. North of the Tropic of Cancer, the interior limit of the Spanish territory seems to be the twelfth meridian west of Greenwich. In the neighbourhood of the equator, where, though Spanish occupation has been practically limited to the islands of Corisco and Elobe in Corisco bay, a claim has been made both to the shores of the bay and to a hinterland stretching indefinitely towards the centre of the continent, the interior limit has been fixed at 11° 20′ E. (9° E. of Paris). On the coast, France secures the greater part of Corisco bay, the frontier following the *thalweg* of the Muni to 1° N. and afterwards that parallel to its intersection with the meridian above mentioned. In the north Spanish territory extends to the frontier of the Cameroons, formed on the coast by the mouth of the Campo. That even so large an extent of country is recognized as Spanish is regarded in France as a concession, agricultural undertakings



CAPE BLANCO AND ADRAR REGION.



MUNI RIVER REGION.

having already been started by French companies within the limits now fixed. Spain, however, accords to France the right of pre-emption in respect of this area, while similar rights are conceded to Spain in respect of Adrar. By this agreement the last of the questions affecting the boundaries of the French African possessions with those of other European powers has been settled.

M. Blanchet's Expedition to Adrar.—As we have already announced, an expedition was organized at the end of last year by the Paris journal *Le Matin*, for the further study of that part of the Sahara lying between the French possessions on the Niger and Algeria. The command was entrusted to M. Blanchet, who had already done good work in the south of Algeria, but who this time started from the Senegal, the country of Adrar, recognized as under French influence by the recent Franco-Spanish convention, being his first objective. According to the *Dépêche Coloniale* of July 5, disquieting rumours regarding the expedition have lately reached Saint Louis, a portion of the native escort of the mission having returned from Adrar with the news that the Europeans of the party had disappeared after a conference with the Moorish chiefs. During the early stages of the expedition, some difficulties had been encountered, but it had been hoped that these were successfully overcome. M. Blanchet, who had with him a capable native as interpreter, hoped to establish friendly relations with the Uled-bu-Saad and other tribes, and it is thought possible that he may have been residing with one of their chiefs while awaiting permission to enter Adrar. It is said that one of the objects of the mission was the search for deposits of nitrates and phosphates, which the analogy which has been noticed between the Western Sahara and the desert regions of Chili has led some to consider likely to be found in the former region.

Jibuti as a Port.—In the *Politique Coloniale* for May 3, M. L. Henrique calls attention to the natural advantages possessed by Jibuti as a port of refuge and supply, and regrets the fact that the credits lately voted for the strengthening and improvement of French naval stations are not to be drawn upon for its requirements. M. Henrique holds that the port possesses merits equal, if not superior, to those of Aden, owing to the facilities which it presents for the loading and unloading of coal, and the presence of an excellent supply of water and fresh provisions. He points out that the almost enclosed basin of Gubet-Karab, at the head of the Gulf of Tajura, could with ease be turned into an impregnable harbour of refuge, to which a branch from the Harar railway might supply land communication with Jibuti. In its present state the latter would be at the mercy of a single company of troops. The subject is recurred to in the issue of the same paper for June 22, which contains charts with soundings of the Gubet Karab above alluded to, and of the Baie de l'Étoile within it, which offers special advantages as an anchorage.

The French in the Western Sudan: Navigation of the Middle Niger.—Of the many French expeditions which during the past year have been active in the western Sudan, one of the most important was that of M. Baillaud, who, setting out in a canoe from Kulikoro early in 1899, navigated the whole Niger from that place to Say. During the return journey, which was made across the bend of the Niger by Dori and Wagadugu to Jenne, he collected valuable information respecting native trade-routes, etc. His further route to Medina on the Senegal led, after passing Bamako, in a direction not often taken by Europeans. M. Baillaud had been preceded in his voyage down the Niger by Captain Granderye, who successfully solved the problem of provisioning Say and other posts by way of the river, thus avoiding the difficult march across country. He made the voyage with fourteen boats of various kinds without losing one, and it is said that this route to the lower French posts will be generally adopted in the future. A journey

made by M. Coppolani, on the borders of the Western Sahara, north of the Senegal and Niger, was also carried to a successful issue. From Guirel, north of Segu, the traveller pushed into the Sahara to Medgarua, in the direction of Tagant.

Mr. Moore's Expedition to the Central African Lakes.—We are enabled to give some additional details respecting Mr. Moore's expedition to Lake Tanganyika, the most important results of which—especially the discovery of the maximum depth of Lake Nyasa (430 fathoms) and the shifting of the position of Lake Tanganyika to the west—have been from time to time recorded in the *Journal*. During the stay at Blantyre, the time was telegraphed to Mr. Fergusson from Cape Town, by arrangement with Sir David Gill, and the error of the watches thus accurately determined. This was done again at Nkata bay, the longitude of which had been fixed by the Anglo-German boundary commission, and at Kituba, on Lake Tanganyika, the value of Mr. Fergusson's astronomical observations being thus greatly enhanced. Had the same facilities been available at the north end of Lake Tanganyika, the new position assigned to the lake could be accepted with complete confidence. Mr. Moore succeeded in making a large collection of fishes from the lake, including some new to science. He also carefully examined the neighbourhood of the Lukuga outlet, the former blocking of which by vegetation he found it difficult to believe. North of Tanganyika, Mr. Grogan's route up the Rusizi valley was followed to Lake Kivu. Two volcanoes were found in a state of activity north of the latter, one of them being presumably that ascended by Count von Götzen in 1894. Like Mr. Grogan, Mr. Moore throws doubt on the existence of Mount Mfumbiro, which has figured on our maps since Speke's time. It may be pointed out, however, that the question is merely one of nomenclature, and that the easternmost of the line of volcanic peaks north of Kivu, ascended two years ago by the German Captain Bethe, was said by him to be known as Kirunga ya Ufumbiro (Count von Götzen's volcano being Kirunga cha Gongo). Proceeding round the west side of Lake Albert Edward, Mr. Moore crossed the Semliki, and examined the neighbourhood of Mount Ruwenzori, which he considers as a mountain range rather than an isolated mountain block. It has many jagged peaks, and extends along the eastern shore of the Albert Nyanza. The peak ascended, which Mr. Moore claims to be the highest of the range, is assigned a height of 16,500 feet, the snow-level being placed at about 13,000. It is not stated, however, on what observations these altitudes depend. From the Albert lake, where additions to the collection of fishes were made, Mr. Moore proceeded to Uganda, and thence to Mombasa, in part by the new railway. The results of the expedition as regards the geological history of the Central African lakes have already been announced.

M. Prins' Explorations in the Shari Basin.—We have before alluded to the geographical work done by M. Pierre Prins, one of the members of the Gentil Mission to Lake Chad, who was left behind by the leader as French representative in Baghirmi. M. Prins' most important exploration was that carried out during a journey from the Gribingi to the camp of the Sheik Senussi of Dar Runga, between November, 1897, and January, 1898, on which many headstreams of the Shari were for the first time crossed near their sources. A summary of the geographical results of the journey, with sectional map of the route, appears in the third number of *La Géographie*, together with an account of M. Prins' subsequent voyage down the Shari to Baghirmi. The map alluded to merely gives, in seven sections, the results of the route survey, and does not therefore present a connected view of the geography of the region. This has, however, been given by M. Wauters in the eighteenth number of the *Mouvement Géographique*, in a map in which the results of the journeys of M. Hanolet and other Belgian officers are also shown. Starting north-east from the French station on the Gribingi, M. Prins crossed the

Bamingi, the main headstream of the Shari, after travelling about 70 miles. It was there some 80 yards wide and 13 feet deep (in December), with a mean velocity of less than a mile an hour, and is probably navigable to the confluence with the Gribingi. Its left-hand branch appears to be the Kukuru of Dybowski, rising in about 7° 30′ north. A little north of the river, Mount Badzo, an isolated granite peak, typical of those scattered over the plains of Dar Runga, was seen. After passing the Balijia range, the route inclined to the east, crossing the Bangoran and other streams, which rise in a range of hills separating Dar Runga from Dar Banda. Granite forms the principal foundation of the country, which, as a rule, is poor in humus. Iron is everywhere abundant. In the basin of the Gribingi manioc is the staple article of food, but beyond the Balijia mountains it is replaced by various kinds of millet. North of 8° N. lat. the arid regions commence. M. Prins collected much information concerning the history and ethnography of the regions traversed. The advent of Mohammedan influence into the regions south of Wadai was ascertained to date from fifty years back, but the religious propaganda is lax in character. The native tribes are various branches of the Banda family. During his voyage on the Shari, M. Prins executed a complete survey of the river from 7° N. to within 40 miles of Lake Chad, and his account supplements in many particulars that of M. Gentil, who saw the river at high water only. He considers that it would be navigable at all seasons for stern-wheel steamers drawing not more than 2 feet when loaded.

The Congo Telegraph.—We learn from the *Mouvement Géographique* that the telegraph line destined to place the Upper Congo in communication with the Atlantic coast has already reached the equator on its way up the river. The chief difficulty encountered has been the passage across the mouth of the Kasai, which at the spot chosen has a width of nearly three-quarters of a mile. The wire is supported by three pillars, one on either bank and one on a rocky islet in mid-stream, two of them reaching a height of 150 feet.

AUSTRALASIA AND OCEANIC ISLANDS.

The Australian Aborigines.*—The recently published work of the Rev. John Mathew brings together in a compact form the salient facts relating to the physical and mental characters of the Australian aborigines, besides dealing with the more special question of the origin of the Australian race, a subject to which the author has devoted special attention for some years. This is treated of in the first four chapters, in which Mr. Mathew enlarges upon the views previously put forward in 1889, in a paper published by the Royal Society of New South Wales. The existing characters of the Australian aborigines are accounted for by the supposition that, far from being a homogeneous race, as has been held by some former observers, the people in question show a mixture of three distinct elements, Papuan, Dravidian, and Malay, the first-named forming the original element, while modifications have been introduced by subsequent immigrations of the other races. The general idea of this theory had already been hinted at among others by Flower and Lyddeker, but is now followed up in fuller detail, and supported by evidence collected from the whole field of Australian ethnology. That the primitive base was Papuan (the term being used in its widest sense), and that this was common to Australians and Tasmanians, is, Mr. Mathew holds, proved by facts from the domain of physiology, mythology, implements, customs, and language. The term Dravidian, used to denote the earlier of the invading elements, is used merely to imply a community of origin with the Dravidians of India, and not a direct descent from the latter. This element is seen chiefly in the Australian system of kinship

* 'Eaglehawk and Crow: A Study of the Australian Aborigines.' By John Mathew, M.A., B.D. London: Nutt. 1899.

and linguistic characters. Malay influence has been slighter, but may account for the absence of woolly hair, and has left some few marks upon the language. The influx is supposed to have taken place from the north-east, and (in the case of the Dravidians) to have poured chiefly down the centre, while the Malay invasion was more sporadic. The three elements may thus be compared with the Keltic, Saxon and Norman in Great Britain. In the latter part of the book the author undertakes a systematic examination of the Australian languages, suggesting a new system of classification.

Austrian Explorations in the Solomon Islands.—The Austrian gunboat *Albatros* was despatched, in 1895, on a scientific voyage to the Pacific ocean, during which particular attention was devoted to an examination of the hydrography, meteorology, and general geography of the Solomon group, where the ship made a lengthened stay in 1896 and 1897. The report on the voyage, by the commander, Captain J. von Mauler, appears in the *Abhandlungen* of the Vienna Geographical Society (1900, Nos. 4 and 5), together with a sketch of the meteorological results by Lieut. Kesslitz. From Sydney a course was laid for the Thousand Ships bay at the south end of the island of Isabel, which it separates from the smaller island of Tuilagi. The bay was carefully examined, and an inlet discovered on its south shore, which affords good anchorage for a limited number of vessels. The narrow channel with low wooded shores (Ortega channel), by which the bay is connected with the sea to the south of Isabel, was also examined, as well as the south-west coast both of Tuilagi and the main island. In the latter, a considerable river was discovered, and named Foullon, after Baron von Foullon-Norbeeck, the geologist of the expedition. Its valley was ascended for several days' march to the Marescot mountains, which were found to be inhabited, though nearer the coast no trace of population was seen. An elevation of 3600 feet was reached, which seemed to be only some 500 feet below the highest summits of the Marescot range. A view was obtained over the northern part of the island and the extensive coral banks on that side. Seen from the south, the whole of Isabel presents the appearance of a mountain chain, which runs from the above-mentioned range, past the Lafarge peak, to the north-west end of the island. The coast is bordered by low hills, divided from the sea by mangrove swamps. A good anchorage was discovered abreast of Mount Lafarge, to which Baron Foullon made a six days' expedition, passing through an exceedingly broken country. Leaving Isabel, the expedition proceeded to Savo island, the volcano of which was ascended. Though not at present active, it does not appear to have been long at rest, and steam was seen to issue from various points in the crater. Between Savo and Guadalcanar no trace could be seen of the dangers marked on the British charts. An area of discoloured water was found to be not caused by shallows, but was apparently due to unexplained local causes. After various cruises along the north coast of Guadalcanar, an expedition was undertaken to the Lion's-head mountain, which resulted in the death of Baron Foullon and several of the crew by a treacherous attack of the natives. The party had reached, after four days' march, a height of 3400 feet, and was, at the time of the attack, attempting the ascent of a steep peak named Tatube, 4200 feet high, a mile or two north-east of the Lion's head (Popomanisao of the natives).* It was only after the greatest exertions that the survivors of the party,

* This is apparently the peak since ascended by Mr. Woodford, starting from the opposite coast (*Journal*, vol. xv. p. 71); but it is not easy to fit the two accounts to each other. According to Mr. Woodford, Popomanisao lies south of the main watershed of the island, while the reverse is shown to be the case in the sketch-map accompanying Captain von Mauler's paper.

including several wounded men, succeeded in reaching the ship. After these events the ship returned to Australian waters, but afterwards resumed work in the Solomons, again visiting Guadalcanar and Isabel, and executing important hydrographical surveys near the north-west end of the latter. The coast was found here to be entirely different from its delineation on the British Admiralty chart, being bordered by lines of islands enclosing an extensive sound, named Austria sound by the navigators. Parts of this occupy positions shown on the chart as mainland. The return voyage was commenced after a visit to Taura peak on Choiseul island.

Trade and Agriculture of Samoa.—The annual consular report on the trade of Samoa during 1899 records a great increase in the value both of imports and exports as compared with previous years. The bulk of the trade was done with the British empire, imports from which had more than doubled since 1897, while, owing to the rising demand for copra in the Australasian colonies, the exports to the British Empire had risen from £5000 in 1897 to £60,000 in 1899. Exports are restricted to three products—copra, cacao, and fruit, cotton and coffee having disappeared from the list. The production of cacao is still in its infancy, but the quality is excellent, and energetic measures are being taken to extend the plantations. Rubber, kola, and vanilla are also being planted, and may form important resources in the future. In an article in *Globus* (vol. 77, No. 8), Dr. Reinecke discusses the agricultural potentialities of the German islands, arriving at the conclusion that, with the termination of the late period of disorder, a great future is open to the islands. He estimates the area of fertile land suitable for plantations as from one-fifth to one-fourth of the whole surface of Upolu. Conditions are somewhat less favourable in Savaii, where the question of water-supply presents even greater difficulties than on Upolu. From the sketch-maps which accompany the paper, it appears that the plantations owned by Germans on the latter exceed in area those of all other nationalities, but that they fall somewhat behind on Savaii.

POLAR REGIONS.

The Danish Expedition to East Greenland.—The administration of the "Carlsberg Fund" in Copenhagen has, as already stated,* provided the means—about £8300—for sending an expedition to explore a difficult part of the east coast of Greenland, the ice-bound coast from Angmagsalik, about 66° N. lat., where the Danish Government has established a station in 1894, and northwards to Scoresby sound, about 70° N. lat. It was agreed that the leader, Lieut. G. Amdrup, R.D.N., should first go up to Angmagsalik in August, 1898, winter there, reconnoitre the coast, lay out depôts with boat and dog-sledges, and explore the tract in the vicinity of Angmagsalik, a tract of special botanical interest. After having executed this first plan with much energy, Lieut. Amdrup and his party returned to Copenhagen in September, 1899.† To execute the second and last part of the plan, the expedition left Copenhagen on June 14 of this year in the *Antarctic*, that had been bought for the purpose. The *Antarctic* is the vessel known from the expeditions of Dr. A. G. Nathorst. It is the intention of Lieut. Amdrup, with three companions—a naval petty officer, a mate from the merchant service, and a sailor-smith—to leave the ship at a convenient point south of Cape Brewster, after having penetrated the ice-belt, and then try to reach Angmagsalik, which perhaps may be done this year. The petty officer and the sailor-smith accompanied Lieut. Amdrup in 1898–99. Lieut. Amdrup is provided with boat, sledges, kayaks, provisions for two years, and a little house, in which the expedition can winter on the inhospitable coast. When all these things have been landed, the *Antarctic*, which carries a

* Vol. x. p. 218. † Vol. xiv. p. 449.

staff of scientific men, will leave to explore the tracts at Scoresby sound and the nearest northern fjords, and then pursue scientific investigations in the Angmagsalik district. The ship will not winter, and it is possible that Lieut. Amdrup and his party may return to Copenhagen with it in the autumn. When he has left the ship, Mr. N. Hartz, botanist, who has accompanied two expeditions to West Greenland, and wintered in Scoresby sound 1891–92 with the expedition of Lieut. Ryder, R.D.N., takes the command. The scientific staff, whose members almost all have some experience in arctic expeditions, consist further of Ch. Krunse, botanist; H. Deichmann, entomologist and ornithologist; S. Jensen, zoologist; Lieut. J. Koch of the army, surveyor; the Swedish Dr. O. Nordenskjöld, geologist; E. Ditlessen, painter. The zoological garden in Copenhagen sends an assistant, Mr. Madsen, with the expedition in order to try to catch some musk-oxen for the garden.

Arctic Exploration in New Siberia.—A sledge expedition, auxiliary to Baron Toll's, will start from St. Petersburg in the autumn, under K. A. Volossovitch, naturalist, who will be accompanied by a topographer. It is expected to reach Ust-Yansk in December. Then, with two Cossacks and seven or eight Yakuts, the explorers will go on sledges to the New Siberian islands. On the Lyakhoff island they will separate; the topographer will go to the New Siberia island, while M. Volossovitch will proceed to Kotelnyi, and through the Anjou peninsula, move along the northern coast of the New Siberia island, joining there the topographer at the Wood Mountains. The chief aim of the expedition is to ascertain the state of the previously made depôts of food, and the establishment of new ones, for Baron Toll's expedition.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

A New Geomorphological Theory.—M. Marcel Bertrand has published in the *Comptes Rendus* of the Paris Academy of Sciences (vol. 130, p. 449) for February last an important article in which he endeavours to combine the theory of Lowthian Green, that the figure of the Earth is based on a tetrahedron with its apex at the south pole, with the theory of Michel-Levy, that the Tertiary rocks of the Earth are distributed along the edges of a tetrahedron, the apex of which lies some 20° from the south pole. This suggests the idea of associating the movement of the pole of the Earth with the tetrahedral deformation of the crust. Going further, M. Bertrand shows that if lines be drawn through all the active volcanoes of the present day, they are found to lie along six slightly deformed great circles which outline two tetrahedra set base to base. These lines of volcanic activity indicate the places where the heavy molten rock-material lies nearest to the surface, where in consequence are the geosynclinals which precede the formation of mountain chains. All the mountain chains, except the Andes, are found along the edges of the northern of the two tetrahedra, which indeed is far from being regular, yet, taken as it is, it has proved to be a remarkable instrument of research. One summit of this tetrahedron lies on the polar circle, and M. Bertrand states his belief that originally the axis of the tetrahedron passing through this summit, the axis of the Earth, and the axis of the ecliptic all coincided, and he considers that the displacement of the axis of the tetrahedron from that of the Earth being the same as the displacement of the axis of the Earth from that of the ecliptic is not accidental. In order to account for the phenomena of the movement of the terrestrial pole over the surface of the Earth, it is necessary to consider the crust as distinct from the interior—to look on the Earth, in fact, as resembling an orange with a movable skin. The superficial tetrahedron is assumed to be due to differences of gravity brought about by an internal tetrahedron outside the neutral zone separating the outer zone of 350 miles thick

from the undeformed nucleus. M. Bertrand goes on to discuss the position of the summits of the terrestrial tetrahedra at the different geological periods by considering the places of occurrence of the various formations, and thus from purely geological evidence to deduce the wanderings of the summit of the tetrahedron over the surface of the Earth. Finally, he indicates how, if the tetrahedron be supposed to have been originally a regular figure, its present degree of deformation furnishes a datum for calculating the age of the Earth. He concludes, "The tetrahedron is the great mechanism, put into action by the cooling of the Earth, which guides and regulates all the movements of the surface; the transmission of these movements being brought about solely by the inequalities of gravity to which they give rise. The entire mechanism is regulated with so admirable a precision, that these minute differences suffice to set the whole into motion. When the period, happily still far distant, arrives when the tetrahedron has acquired its position of equilibrium, the central mechanism will stop, the movements will gradually die out, denudation will level everything, for there will be no counter-influence, and the geological life of the Earth will come to an end." In a paper read to the Academy at a subsequent meeting, M. de Lapparent points out that M. Bertrand's modification of Green's theory detracts from the complete applicability of his eloquent peroration, which would be much more nearly true of Mr. Green's conception of the gradual passage of the Earth's figure from a sphere, which has the minimum of surface for its volume, to a tetrahedron, which has the maximum of surface. This, he points out, does not hold good for M. Bertrand's hypothesis of two tetrahedra united by their bases, *i.e.* giving the Earth the form of an irregular hexahedron. He warns geologists against being led away by the seductive appearances of a learned and ingenious theory from a much simpler explanation of the facts which nothing has yet been brought forward to confute.

The Glacier Conference of 1899.—The fourth number of *Petermanns Mitteilungen* for the present year contains the report by Prof. E. Richter on the conference which met last August at Gletsch, in Wallis, at his invitation, to discuss points of interest relative to the science of glaciers. The proceedings of the conference, at which some sixteen scientists took part, consisted both in discussions and in visits of inspection to various sections of the Rhone glacier, and, as a practical result, a number of resolutions and recommendations were arrived at, having reference to points of nomenclature, questions of glacier-structure, and desiderata for future work. They are printed in full as appendices to Dr. Richter's paper, and only a general idea of their tendency can be given here. Three of the resolutions related to the special phenomena of the Rhone and lower Aar glaciers, while others dealt with the classification and nomenclature of moraines, and the points deserving of special research in the future. It was decided that moraines should be classed under the two main headings of moving and deposited moraines, each of these divisions being again twice or more subdivided according to their vertical or horizontal position, etc., terms for each kind being fixed in German, French, and English. The determining factors in the classification of moraines, both in reference to their composition and mode of origin, were also laid down. Sixteen desiderata for future research were tabulated under the four headings of (*a*) structure, (*b*) moraines, (c) movement and temperature, (*d*) economy. Under the last heading are included points relating to the volumes of glacier streams and the amount of precipitation over their collecting-grounds, the seasonal variation in the amount of mud carried by the streams, etc. The points put down for investigation under the third head include the determination of the rate of movement at different depths, and of the vertical component in surface-movement, the elucidation of differential movements of the ice, and of seasonal variations. Among miscellaneous resolutions

was one by which the term "stratification" was restricted to its geological sense, as, *e.g.*, when used in reference to the deposits in the region of *névé*; the term "banding" being chosen to designate the alternation of layers of ice of varying character.

Comparative Studies in Climate.—Prof. Hildebrandsson has continued his investigations into the meteorological conditions of the "centres of atmospheric action," by examining the deviations from the mean rainfall at the most important centres for which he could obtain data. The results corroborate those of his previous researches on variations of pressure. They point to a constant opposition between the deviation from the mean atmospheric conditions at Iceland and the Azores (the low and high pressure centres of the North Atlantic), and in winter a constant agreement between those of the Azores and Central Siberia (both high pressure centres in winter), and also at stations between them along the high-pressure axis. In summer the rainfall like the pressure indications are not so sharply contrasted or so coincident. From October to March the deviation curves of Mauritius and East Australia—New Zealand are opposed; and also those of Alto da Serra, Brazil (23° 40′ S., 46° 30′ W.), and Cordoba, in Argentina. The value of these important researches on practical affairs is very great, and the Upsala professor points out several interesting relationships. One of the most important of these is that the deviations of rainfall from the normal in Siberia from October to March is in general inverse to that in India in the following summer. Unfortunately, this rule has important exceptions about once in ten years, for two have occurred in twenty-one years. The winter rainfall at Thorshaven, in the Faeroes, has the same character, above or below the mean, of the previous summer at St. John's, Newfoundland, and of the following summer at Berlin. Professors Pettersson and Meinardus have pointed out relationships between the temperature of the Gulf Stream and meteorological phenomena in Western Europe. Both, however, may have a common cause, for there is an exact agreement in the trends of the rainfall curves for the winter in British Columbia and the following autumn in the Azores, during the fifteen years for which data are available, and here one ocean current does not affect the two places. The need for regular observations at the centres of atmospheric action is obvious. It is important that new stations should be formed, *e.g.*, at St. Helena (*Kongl. Swenska Vet. Akad. Handlingar*, Band 32, No. 4).

GENERAL.

Murray's Handy Classical Maps.—Four of these useful and scholarly sheets have been published—Hispania, Gallia, Britannia, and Italia—the last on a larger scale and in two map-pages. Each has a full index of all the names marked in the sheet; thus Italy runs to nine pages (five-columned) of place-names. Important modern names are included, as well as ancient; the chief variations of the coast-line are indicated in fainter marking. As to this last point, in reference to Roman Britain, some good judges think the southern shore of the Humber has been greatly altered, and this perhaps might have been taken into greater account, as it is in the region of the Wash. In the same map the question of the forest region presents great difficulties; and the extent of this region in the Selwood country of the south-west, in the midland forest of Arden, in the district of Elmet, round the modern Leeds, and in the great northern forest of Selkirk occupying the basin of the upper Tweed, Ettrick, and Teviot, might have been shown more fully. One-third of Britain was covered with forest at the Roman occupation, and this fact has received attention in some other parts of the map, as in the south-east, where the Andreds-Weald between the South Downs and the valley of the lower Thames is very well given. Yet Selwood and Arden were certainly quite as formidable barriers to the English conquerors; and hardly less serious were the obstacles of

the forest of Wyre on the middle Severn, stretching almost as far as the county of Cheshire; of the woodland track between Hampstead and the Fen country; and of the forests of Sherwood and Needwood filling the bulk of the space between the peak of Derbyshire and the Trent. Referring again to the question of the Fenland of early Britain, this might have been considerably extended—on one side further up the river Witham, quite to the neighbourhood of the Lincoln rise, and on another side along the lower course of the Parrett in Somerset. "To realize the Britain of the Roman age, we should perhaps take the Northern Russia of our own, a country into whose tract of forest lands man is still hewing his way, and where the clearings round town and village hardly break the reaches of silent moorland or as silent fen." Even at the close of the Roman occupation, the river valley was still often "mere strips of culture which threaded their way through a waste." In this map the hill markings seem to be clear and adequate, like the river-courses, though greater breadth might have been suggested for some of the latter at this early time (*e.g.* the Lea). The indication of the Roman roads, fortresses, and harbours are matters to which great attention has been given, and these appear to be thoroughly well done. But the fulness of the reconstruction on this side must be balanced by an equally full treatment of the natural difficulties, if we are to escape the impression of a country more civilized, populated, and "subdued to the use of man" than was really the case till a later period. Some of the chief centres of industry and mining in early Britain are shown in this plan, such as the lead-mines to the south-west of Bath and the iron-mines in the forest of Dean; but no clear indication is given of the mines of Cornwall, perhaps the most famous, if not the most extensive, of all our ancient metal works, or of the mineral deposits in the neighbourhood of Droitwich and Alcester. In the publication of these handy maps, which well deserve their title, every care has been taken to secure a good result. The colouring is distinct, the general outline is well marked, and the accurate shading of the various elevations should be useful to all students. A great deal of trouble has been taken in the preparation of these sheets, but the firm which published Stanley's 'Sinai and Palestine' has long ago given us even more detailed work in the same kind of cartography. For a map showing land-formations in heights and depths, an excellent result is obtained by relief maps, such as are given in Frye and Herbertson's 'Illustrated School Geography,' pp. 104, 142, etc.; and indeed such effects, catching so well the appearance of an actually raised surface, are more satisfactory than those attained by colour methods only. The natural difficulties of Britain at the close of the Roman occupation are in some ways better presented, though with some omissions and on a smaller scale, in the general map facing p. 26 of Green's 'Making of England,' and in the sectional maps on pp. 41, 59, 70, 77, 88, 99, and 126 of the same volume. But the mere publication on separate sheets of serviceable and fairly large-scale maps of the chief countries of the Roman world is in itself a thing for which every reader of ancient and mediæval history must be thankful.

The Ground-plan of Towns.—In the sixth number of the *Zeitschrift* of the Berlin Geographical Society for 1899, Dr. Otto Schlüchter discusses the various forms observable in the ground-plan of German towns, and their mode of origin. The study is to a large extent based on previous literature—much of which is, however, not widely known—and in particular on a work of J. Fritz, which formed an appendix to an educational syllabus issued at Strasburg in 1894. Dr. Schlüchter, however, extends the inquiry in certain directions not followed up by Fritz. The latter drew a broad distinction between the towns of Western and Southern Germany and those east of the Elbe. The former he considered to be, as a rule, quite

irregularly grouped around a central core, which represented either an original village or a religious or military foundation; while the towns of Eastern Germany were shown to owe their form to a distinct design, imposed by their founders at the time of the Germanizing of the east. The plan of the latter consists of a square or oblong market-place in the centre, while the streets run in straight lines at right angles to its sides. The orientation is, as a rule, in accord with the cardinal points of the compass. The whole is surrounded by a circular or elliptical rampart with a general diameter of some 500 yards, both the form and the nature of the fortification being probably of Slav origin. In certain cases this form is repeated once or even twice, as at Rostock, where three sections of the same general plan occur side by side. Such forms are also found in Western Germany, with slight modifications, and their prototype seems to be the Roman *castrum*. Dr. Schlüchter enters more minutely into the subject of the irregularly built towns of the west than was done by Fritz. He is of opinion that a certain amount of design may be traced in their plan, pointing out that even the field-paths, which in some cases determined the direction of the future streets, must have been traced with some distinct aim. A radial arrangement, affording the easiest means of access from the several gates to the market-place at the centre of the town, is, he thinks, generally to be noticed, while the influence of river-courses in determining the direction of the streets is often observable. The action of a central authority is especially noticeable in relation to the fortification of towns. The paper ends with a sketch of the historical development of town plans down to the present day, when regular patterns, little adapted to meet the requirements of traffic, are so much in favour.

OBITUARY.

Lord Loch.

A ZEALOUS and devoted servant of the British Empire has passed away in the person of Lord Loch, who died in London on June 20, at the age of seventy-three years. During the earlier part of his life, before definitely adopting the career of civil work with which his name is now associated, Lord Loch had passed through the most varied experiences, serving both in the navy and army, and undertaking other work abroad of an equally adventurous kind. With the navy he was connected only during his very early years, for after two years' training as a midshipman, being then only seventeen, he joined the 3rd Bengal Cavalry, taking part in the Sutlej campaign of 1845. His next active service was in the Crimean war, in preparation for which he was entrusted with the special task of organizing the Turkish troops in Bulgaria. Leaving the army at the close of the war, he, in 1856, accompanied the expedition to Canton, afterwards joining Sir F. Nicholson and Captain Osborn on an exploring expedition up the Pei-ho river. In 1860 he accompanied Lord Elgin as private secretary during his second embassy to China, and after the outbreak of hostilities underwent a terrible experience, being taken prisoner with Mr. (afterwards Sir Harry) Parkes, loaded with chains, and thrown into a Chinese dungeon amid criminals of the lowest type. The prisoners finally escaped only a quarter of an hour before the arrival of an order for their execution.

In 1863, after a short period of service as secretary to Sir George Grey, Mr. Loch became lieut.-governor of the Isle of Man, where, with his wife whom he had married in 1862, he spent eighteen happy but uneventful years. In 1884 he became governor of Victoria—a post which he filled with much success—and in

1889 governor and high commissioner at the Cape, where questions of unusual difficulty confronted him. In 1895 he retired, and received a peerage. He leaves a widow and three children, the only son being a lieutenant in the Grenadier Guards, and now serving on the staff in South Africa.

Lord Loch joined the Society so long ago as 1859, and after his retirement served on the Council for several years.

Major-General Sir R. Murdoch Smith, R.E., K.C.M.G.

By Sir FREDERIC J. GOLDSMID, K.C.I.E., C.B.

By the death, on the 3rd inst., of Sir Robert Murdoch Smith, not only has the Department of Science and Art in Edinburgh sustained the loss of an earnest and intelligent director, but H.M. Government will miss one of its best authorities on Persia, as regards local geography and the manners and customs of its people. It is probable, moreover, that few, if any, of our diplomatists had a truer appreciation than the deceased officer of both the foibles and redeeming features of the Persian national character.

Son of Dr. Hugh Smith, of Kilmarnock, he was born in August, 1835, and admitted lieutenant Royal Engineers in September, 1855, captain in 1864, major in 1873, lieut.-colonel in 1881, colonel in 1885, and major-general (retired) in 1887. Nominated in 1863 to command the detachment of Royal Engineers to construct and work the line of overland telegraph connecting England with India, he was for some twenty years director of the Persian section of this important undertaking. During that period he succeeded in gaining the confidence and goodwill of the Shah and his advisers, and could also claim the friendship and regard of the several diplomatists who, apart from the British legation, looked after the interests of the respective European Powers represented at Tehran. How he and his professional colleagues overcame the difficulties originally thrown in their way by the ignorant obstruction of native officials and other causes, has long since been set forth in the printed records of the India Office. One extract from the completion report addressed by the assistant director-in-chief, Colonel Champain, to the Bombay secretariat in October, 1865, may be quoted by way of illustration: "Captain Murdoch Smith, R.E., has been, perhaps, more annoyed . . . than any other superintendent. Time after time has his progress been stopped for no reason whatever, and it often seemed that it would be impossible to complete the line. To the end, however, Captain Smith has laboured with the most untiring patience and unconquerable determination. His line is beautifully laid out and finished, and he deserves the greatest credit." Before becoming attached to the Persian telegraph in 1863, Smith had been employed in conducting excavations and researches at Halicarnassus and on the African coast, and was joint author with Captain Porchor, R.N., of an interesting and admirably illustrated volume on Cyrene. Since 1885 he had been director of the Museum of Science and Art in Edinburgh, but was employed on a special mission to Western Persia in 1887, on return from which he was made a K.C.M.G. In further acknowledgment of his public services, Sir Murdoch Smith was presented in recent years with the freedom of his native town of Kilmarnock. He was also a J.P. for Edinburgh. He did much towards the illustration of Persian art as exhibited in the South Kensington collections, and wrote a useful and instructive manual regarding it. Among the contributions which he supplied to periodical literature may be specially mentioned a short sympathetic paper on his friend and former chief, Sir John Bateman-Champain, R.E., published in the *Royal Engineer's Journal* in March, 1887, and an able statement of the advantages offered by the Karun river for penetrating into

the interior of the Shah's dominions. The latter, read in May, 1889, was justly characterized by Prof. Vambery as "full of interesting details, and perhaps the best paper hitherto published on the subject." Sir Murdoch Smith joined the Society in 1868.

Murdoch Smith was a delightful travelling-companion, as the present writer can testify from personal experience in 1865–66, when they accomplished a journey of some 800 miles together, across snow and desert, from Tehran to Sabristan. At the latter place they parted, one to find his way to the Makran coast at Charbar *viâ* Bampur, the other to reach Charbar by Bandar Abbas and the coast-line from the west. The writer has recorded that after parting from his friend he passed the night in the manger of a Perso-Baluch stable, but he is not conscious of complaint or privation on that score. What he really missed was the pleasant converse of his travelling-companion in the days preceding. That voice is now effectually hushed, but its music is not forgotten.

CORRESPONDENCE.

The Life of Calcutta as a Seaport and the Mercantile Capital of Asia.

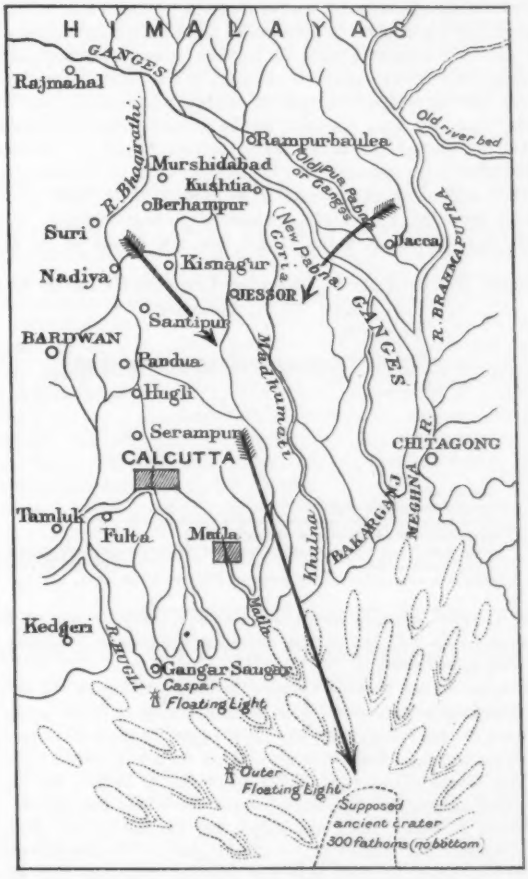
THE appearance of some interesting papers, as that of Mr. H. Benest's on river outlets and submarine formations, in our last volume of the *Geographical Journal*, reminds me of sundry geodetical and geological researches of some importance which I was led to undertake "in the young days of old" (1860–62), when Superintending Engineer of the Presidency Circle of Bengal—a district embracing Calcutta and most of the surrounding rich delta of the Ganges, or, rather, of the Hugli, Matla, Gorai, and sundry main outlets of the great river.

Fortunately, my Engineer notebook gives much reliable and original data taken down in pencil on the spot while inspecting and surveying amidst this vast network of these large and small streams or swampy *sûndarbands* of slowly moving waters. Everywhere our engineering staff were constructing roads, irrigation channels, embankments and civil and military buildings, and my attention was constantly drawn to establishing, if possible, the best substrata on which to found all ordinary foundations.

This led to a good deal of deep boring in and around Calcutta, even to a distance of 40 to 50 miles; the study of old and modern native and European maps, and especially of many ancient water-levels; the reports and correspondence of my predecessors, and of geologists and travellers—papers long buried in dusty pigeon-holes. In some of these one could occasionally detect remarks, to which, however, no importance seems to have been attached, but which, with my own investigations, showed that a vast slow geogonic movement had been ever in progress, giving to all waters a general trend much further eastward than Calcutta. This movement must, and probably within a century or two, dry up its port, and leave the Hugli a mere creek, suitable only for small native craft to at least as far south as the shallows of the much-feared "James and Mary."

The once small town and district of Hugli have, according to Indian traditions and geologists, been only peopled about one thousand years, when probably the main stream overflowed at the junction of the Bhágarathi, and so gained access eastward to Rampur Beauleah. Until then the Ganges was known to lower Bengalis by its ancient local name, Bhag-irathi, and as such it fertilized all the rich plains of Berhampur, Murshidabad, and Nadiya, raising dismal swamps and lakes by rich deposits till Nadiya became "the Garden of Bengal," and its chief town the capital of lower Bengal about 1200 A.C.

An apparent rising of the Ráj-mahál hilly tracts, or sinking of the central delta some 50 to 60 miles east of Calcutta, has continued, however, to withdraw the main Gangetic stream from its old pastures, though still sending off thitherwards such huge overflows as the Jalangi, Matabhanga, and many Nadiya rivers, which our engineers have for half a century been labouring to keep open; for the main



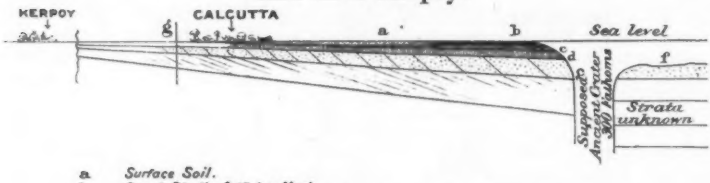
LOWER GANGES REGION.

stream presses south-east to the Kushtia-Pabna districts, where it receives a check from the higher levels in and around Dacca. At Jafarganj and Goalanda its volume is trebled by the great Brahmaputra ("child of Brahma"), here called the Jamuna; the joint stream—the Ganga or Padma ("Lotus goddess"), still presses south-east, and emerges as the "Meghna channels," in the Bakarganj delta, nearly opposite Chitagong.

The lines of least resistance or of lower levels at present, however, point—as per our arrows—along the western portions of the Jessor and Khulna districts, say 50 to 60 miles east of Calcutta, and some 30 miles east of Matla, or "Port Canning," so-called after Lord Canning, in whose reign this all-important subject attained great prominence, which would have, but for the Mutiny, ended in more than the present railroad and wharfs. The line of greatest thrust points to the mysterious abyss, some 80 miles seawards and eastward of the "Outer Floating Light," where mariners anxiously await pilots to guide them amid the strong currents and many dangerous and ever-shifting shoals, all pointing towards the supposed crater of unknown depth and extent—unknown, at least, in the fifties and early sixties.

Of course, the sad prospective death of our beautiful capital, "the Metropolitan City of Asia," has been long discussed by the scientific officers of various governments, but so far, the only real action taken has been 35 miles of railway to Matla. Down to the fifties large steamers used to sail from Calcutta to Allahabad, but this ceased in 1860, and, although Calcutta is 90 miles from the sea, it may be now considered the beginning of the shoals and labours of steam-dredgers. It must share the fate of Gaur, also once on the Ganges, and the capital of the delta before

Geological Section from supposed Ancient Crater to Calcutta and on to Kerpoy.



a *Surface Soil.*
b *Sand, Shells & Violet Mud.*
c *Blue Clay with much vegetable matter passing into peat.*
d *Clay, Sand, Mica, Pebbles & Kankar.*
e *Sand with bands of clay, pebbles of Quartz & Felspar, bones, pieces of slate, limestone & shingle in fine sand.*
f *Mud, Shells & Sand.*
g *Bore hole in which the borer broke at 481 feet in fine sand.*

Calcutta, or Kálighát, emerged from the ocean; and Gaur too was on the bank of Káli's river, the Kála-indi, but is now known only by some fine ruins, buried in forest and long grassy swamps.

Our geological section through Calcutta to the sea will show the difficulties our Engineers have here to contend with in securing foundations for heavy buildings, such as towers, church spires, forts, etc. If too great depth is attempted, the whole bursts up like a geyser, as befel us when seeking for a solid base for the high spire of the Seáldah church in Calcutta. After excavating to 12 feet, and finding fairly strong clay and kankar for some depth below, the whole foundations were burst up by volumes of water, sand, and clays, and we had to try other devices—engineering matters our readers may not care about. On this occasion we bored down to 480 feet, when the borer gave way, and the result was still sand, kankar, pebbles, driftwood, roots, etc.; yet the engineers made good their spire, then the handsomest in Calcutta.

The Hugli, quasi ancient Ganges, was probably the western limits of the great alluvial basin, and its base is usually kankar and yellow clay, covered with modern deposits. As these accumulated, and "the sandheads" extended seawards, they threw back the waters of the Bhágirathí and Jalangi, thus silting up their channels, and in consequence, we find layers of sand and soil on the banks of these and adjacent rivers, far beyond the reach of any known existing floods.

As the Kústia-Gorai or Madhumati deepens, it must bear away the main stream of the Ganges 100 miles east of Calcutta, and, silting up all the present valuable and huge overflows, reach the sea in the wide indenture separating the districts of Khûlna and Bâkarganj. This was evidently the opinion of such a high authority as Captain Shirwell, who stated that in 1856 he found the entrance of the Gorai 616 yards wide, whereas in 1838 it was only about 200 yards across.

The Ganges drains an area 26 times that of the Thames, and 5 times that of the Po; it discharges 6 times the volume of the Po, and 148 times that of the Thames; and if Adria was, as history relates, the station of the fleet of Augustus Cæsar, and is now 20 miles from the sea, the Ganges delta must have advanced some hundreds of miles within the same time. Hence the certainty of the death of our great capital on the Hugli.

J. G. R. Forlong,
Major-General.

11, Douglas Crescent, Edinburgh, June, 1900.

P.S.—Since writing my note on "The Life of Calcutta as a Sea-port," I observe the following in the *Homeward Mail* of 2nd inst., showing that the Rangoon outlet of the Irawadi is also so fast silting up as to cause anxiety to the large commercial communities inhabiting the city and neighbourhood of Rangoon:—

"The Irawadi of Burma, like the Indus at Dehra Ghazi Khan, is, according to a Rangoon paper, gradually approaching a period when it will be a terrible danger to the country. The mud swept down by the river to the plains from the hills has constantly been spreading itself over the river-bed, so that the bed has been rising year by year. This has necessitated a constant construction of embankments, continually growing higher and higher. Before very long the river-bed will be higher than the surrounding country, in which case a breach of the embankment would mean widespread disaster."

Nothing but a well-organized system of steam-dredgers, such as the energetic merchants and engineers of Glasgow have established on the Clyde estuary, can save cities situated like Calcutta, Glasgow, Rangoon, etc.

J. G. R. Forlong.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1899–1900.

Fourteenth Ordinary Meeting, June 25, 1900.—Sir Clements Markham, K.C.B., F.R.S., President, in the Chair.

Elections.—*Lieut.-Colonel Archibald Adams, I.M.S.; Herbert Apperley; Captain C. F. Beeching, 3rd R. W. Kent Regt., B.C.A. Administration; Colonel Sir William S. S. Bissett, R.E., K.C.I.E.; Egerton Brydges; Charles Edward Campbell; Joseph Cross; Captain Metcalfe Dale, Lincoln Regiment; Captain Austen James Digan, D.S.O.; Rear-Admiral Charles Drury; William H. George; Major A. C. MacDonnell, R.E.; Arthur Mallalieu; H. P. Fitz-Gerald Marriott; Colonel Wm. James Massy, late 1st Batt. Norfolk Regiment; Kôzui Otani, Fellow of the Tokio Geographical Society; Harold G. Parsons; Lieut. Robert F. Scott, R.N.; Percy Arthur Silburn; Mark Aurel Stein, Ph.D.; Captain Cosmo Gordon Stewart, R.A.*

The Paper read was:—

"Results of the Sir George Newnes Antarctic Expedition." By C. E. Borchgrevink.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By HUGH ROBERT MILL, D.Sc., LL.D., *Librarian*, R.G.S.

THE following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full :—

A. = Academy, Academie, Akademie.
Abh. = Abhandlungen.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Com. = Commerce.
C. Rd. = Comptes Rendus.
Erdk. = Erdkunde.
G. = Geography, Geographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
Iz. = Izvestiya.
J. = Journal.
k. u. k. = kaiserlich und königlich.
M. = Mitteilungen.
Mag. = Magazine.
Mem. = Memoirs, Mémoires.
Met. = Meteorological.
P. = Proceedings.
R. = Royal.
Rev. = Review, Revue.
S. = Society, Société, Selskab.
Sitzb. = Sitzungsbericht.
T. = Transactions.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.
Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

A selection of the works in this list will be noticed elsewhere in the "Journal."

EUROPE.

Alps. **Forbes.**

Travels through the Alps. By the late James D. Forbes, F.R.S. New edition, revised and annotated by W. A. B. Coolidge. London: A. & C. Black, 1900. Size 9½ × 6½, pp. xxxviii. and 572. *Portrait, Maps, and Illustrations. Price* 20*s. net. Presented by the Publishers.*

A collection of several works of the late Principal J. D. Forbes, describing his early travels through the Alps, where he was the pioneer of British climbers. A preface explains the manner in which the original books and memoirs have been modified in this edition, and the editor also adds an introduction, some preliminary matter, and a complex of footnotes explanatory, critical, and supplemental.

Austria—Languages. **Gonzaga.**

La Questione delle Lingue in Austria. Rapporto del conte Carlo Valenti Arrivabene Gonzaga.—Bollettino del Ministero degli affari Esteri. May, 1900. Roma, 1900. Size 9½ × 6½, pp. 10.

A classification of the linguistic composition of the population of the various provinces of Austria.

Austria—Tirol. *Z. Deutsch. u. Österreich. Alpenv.* **30** (1899): 43–57. **Alton.**

Enneberg in seinen wirthschaftlichen und socialen Verhältnissen. Von Dr. Johann Alton.

Enneberg is a branch valley of the Gader Thal, which enters the Puster Thal from the south. The economic and social life of the people is the subject of this paper.

Denmark—Copenhagen.

Copenhagen, the Capital of Denmark, published by the Danish Tourist Society. Copenhagen, 1898. Size 9 × 6½, pp. 112. *Map and Illustrations. Presented by the Danish Tourist Society.*

A well-illustrated guide-book to Copenhagen.

Eastern Alps. *Z. Deutsch. u. Osterreich. Alpenv.* **30** (1899): 1–17. **Ranke.**

Erinnerung an die vorgeschichtlichen Bewohner der Ostalpen. Von Johannes Ranke. *With Illustrations.*

On the remains of primæval man in the valleys of the Eastern Alps.

Europe—Population. *B.S.G. Italiana* **1** (1900): 94–102, 185–197, 281–306. **Pasanisi.**

La popolazione dell' Europa. Nota del dott. Fr. M. Pasanisi.

France. *Mém. S. Spéléologie* **3** (20) (1899): 1–34. **Martel.**

L'Aven Armand, les Grottes de Ganges, les Gouffres de Sauve. Par E.-A. Martel. *With Plans and Illustrations.*

France—Bordeaux. *B.S.G. Com. Bordeaux* **26** (1900): 129–136. **Foncin.**

Bordeaux et l'esprit Colonial. Par M. P. Foncin.

France—Bordeaux District. **Hearn.**

Trade of Bordeaux and district for the year 1899. Foreign Office, Annual No. 2415, 1900. Size 10 × 6, pp. 58. *Price* 3*d.*

This is a remarkably full and interesting report, one of the few which could be recommended to any teacher or student of commercial geography as a model specimen of the study of the economic conditions of a considerable region.

France—Corsica. **Holmes.**

Trade of Corsica for the year 1899. Foreign Office, Annual No. 2418, 1900. Size 10 × 6, pp. 12. *Price* 1*d.*

France—Ille-et-Vilaine. *C. Rd.* **130** (1900): 1163–1166. **Lechartrie.**

Cartes agronomiques du canton de Redon. De la composition des terres au point de vue de la chaux, de la magnésie, de la potasse et de l'azote. Note de M. G. Lechartier.

France—Lorraine. *C. Rd.* **130** (1900): 598–600. **Bleicher.**

Sur la dénudation de l'ensemble du plateau lorrain et sur quelques-unes de ses conséquences. Note de M. Bleicher.

Germany. **Gastrell.**

Economic Position of the German Empire in 1900. Foreign Office, Annual No. 2400, 1900. Size 10 × 6½, pp. 44. *Price* 2½*d.*

A comprehensive report on the economic progress and present resources of the German Empire, with elaborate statistical appendices of imperial revenue and expenditure from 1872 to 1900.

Germany—Hesse. **Bergmann.**

Die Volksdichte der Grossherzoglich Hessischen Provinz Starkenburg auf Grund der Volkszählung vom 2. Dezember 1895. Von Dr. Karl Bergmann.—Forschungen zur deutschen Landes- und Volkskunde . . . herausgegeben von Dr. A. Kirchhoff. Zwölfter Band. Heft 4. Stuttgart: J. Engelhorn, 1900. Size 9½ × 6½, pp. 297–364. *Map. Price* 5.70 *m.*

Germany—Prussia. **Bernal.**

Trade of Pomerania for the year 1899. Foreign Office, Annual No. 2403, 1900. Size 10 × 6, pp. 64. *Price* 3*d.*

It is mentioned in this report that the use of ice-breakers has been so successful at Stettin as to make the port now practically an open one all the year round, except in those rare winters when the western Baltic is blocked with ice.

Germany—Prussia. *Sitzb. A. W. Berlin* **(19)** (1900): 303–316. **Schuchhardt.**

Das Römercastell bei Haltern an der Lippe. Von Dr. C. Schuchhardt. *With Plan.*

Germany—Prussia. **Fox.**

Die Pässe der Sudeten unter besonderer Berücksichtigung der Zentralsudeten. Von Dr. Robert Fox.—Forschungen zur deutschen Landes- und Volkskunde . . . herausgegeben von Dr. A. Kirchhoff. xiii. Band, Heft 1. Stuttgart: J. Engelhorn, 1900. Size 9½ × 6½, pp. 88. *Map. Price* 5.20 *m.*

Germany—Prussia. *Globus* **77** (1900): 201–207, 220–224. **Tetzner.**

Die Polaben im hannöverschen Wendland. Von Dr. F. Tetzner. *With Sketch-map and Illustrations.*

Germany—Thuringia. *M.G. Ges. Jena* **18** (1900): 52–96. **Berg.**

Litteraturbericht zur Landes- und Volkskunde Thüringens. Bearbeitet von Alfred Berg.

This bibliography contains 240 titles of books and papers on Thuringia published between 1894 and 1899 inclusive.

Germany—Thuringia. *M.G. Ges. Jena* **18** (1900): 32–51. **Wiefel**

Das Sormitzgebiet, physisch-geographische Skizze. Von C. Wiefel.

This is a small area of the Frankenwald belonging politically to the little states of Schwarzburg-Rudolstadt, Sachsen-Meiningen and the two principalities of Reuss.

Germany—Württemberg.

Wirtembergisches Urkundenbuch. Herausgegeben von dem Königlichen Staatsarchiv in Stuttgart mit Unterstützung der Kommission für Landesgeschichte. Siebenter Band. Stuttgart, 1900. Size 13 × 10, pp. xxxii. and 554. *Presented by the K. Universitätsbibliothek, Tübingen.*

The archives of Würtemberg for 1269–1276 are reproduced in this volume in their original Latin.

Greece. *B. American G.S.* **32** (1900): 151–157. **Young.**

Peloponnesian Journeys. By Clarence H. Young.

Greece—Cyclades. **Cottrell.**

Trade of the Cyclades for the year 1899. Foreign Office, Annual No. 2411, 1900. Size 10 × 6½, pp. 14. *Price* 1*d.*

Greece—Piræus. **Walsh.**

Trade and Agriculture of the Piræus for the year 1899. Foreign Office, Annual No. 2410, 1900. Size 10 × 6½, pp. 16. *Price* 1*d.*

Greece—Thessaly. **Merlin.**

Trade and Agriculture of Thessaly for the year 1899. Foreign Office, Annual No. 2385, 1900. Size 10 × 6½, pp. 16. *Price* 1*d.*

This report gives the new territorial division of the province of Thessaly into four prefectures.

Iceland. **Bruun.**

Arkæologiske Undersøgelser paa Island foretagne i Sommeren 1898. Af Daniel Bruun [København], Ernst Bojesen, [1899]. Size 9½ × 6½, pp. 48. *Illustrations. Presented by the Publisher.*

Iceland. *Aarb. Nord. Old. Historie* **14** (1899): 273–316. **Hammerich.**

Studier over islandsk Musik. Af Angul Hammerich.

Iceland. *Scottish G. Mag.* **16** (1900): 265–293. **Pjetursson.**

The Glacial Palagonite-Formation of Iceland. By Helgi Pjetursson.

Italy. **Benham.**

Trade of Italy for the years 1898 and 1899. Foreign Office, Annual No. 2390, 1900. Size 10 × 6, pp. 60. *Diagrams. Price* 8½*d.*

This report contains a number of statistical diagrams showing the trade of Italy in a graphic form.

Italy. **Neville-Rolfe.**

Trade of Southern Italy for the year 1899. Foreign Office, Annual No. 2376, 1900. Size 9½ × 6, pp. 26. *Price* 2d.

This report mentions the discovery of valuable deposits of guano in some islands of the Red Sea in the Italian possessions.

Italy—Leghorn and Ancona. **Carmichael and Tomassini.**

Trade of Leghorn and Ancona for the year 1899. Foreign Office, Annual No. 2417, 1900. Size 10 × 6, pp. 26. *Price* 2*d.*

Italy—Lombardy. **Armstrong.**

Trade of Lombardy for the year 1899. Foreign Office, Annual No. 2413, 1900. Size 10 × 6, pp. 12. *Price* 1*d.*

Hailstorms do much damage to the silk industry in Lombardy by destroying the mulberry trees, and experiments which have been instituted to avert hailstorms by firing specially constructed cannon at the clouds are stated to have had a certain amount of success.

Italy—Pantellaria. *Globus* **77** (1900): 137–143. **Mayr.**

Pantelleria. Von Dr. Albert Mayr. *With Map and Illustrations.*

Italy—Venice. **Zuccato.**

Trade of Venice for the years 1898–99. Foreign Office, Annual No. 2380, 1900. Size 10 × 6, pp. 26. *Price* 2*d.*

The Peninsular and Oriental Company are discontinuing their steamer service from Venice to Brindisi and Port Said.

Jura Mountains. *Mém. S. Spéléologie* **3** (21) (1899): 1–72. **Fournier and Magnin.**

Recherches spéléologiques dans la chaine du Jura. Par Mm. Fournier et Magnin. *With Plans.*

Mediterranean Region. *La G., B.S.G. Paris* (1900): 261–266. **Bonnier.**

Remarques sur les variations des limites de la région méditerranéenne. Par M. Gaston Bonnier.

On the Mediterranean region as marked by vegetation.

Portugal. **Harrison.**

Trade of Portugal for the years 1897 and 1898. Foreign Office, Annual No. 2378, 1900. Size 10 × 6½, pp. 54. *Price* 3*d.*

Rumania—Population. ———

Mouvement de la population de la Roumanie en 1894. Precedată de o Introducțiune cu date retrospective de Leonida Colescu. Bucuresci, 1900. Size 12½ × 9½, pp. 6, liv., and 56.

Russia—Coal. **Cooke.**

Coal Crisis in Russia. Foreign Office, Miscellaneous, No. 523, 1900. Size 10 × 6½, pp. 8. *Price* ½*d.*

A summary of the Russian coal-supply from native sources.

Russia—Finland. *Meddelanden G. Fören. Finland* 5 (1899–1900): 1–64. **Boldt.**

Ortbeskrifningen i Finland på 16—och 1700—talen. Anteckningar af R. Boldt.

Description from contemporary manuscripts of the districts of Finland in the sixteenth and seventeenth centuries.

Russia—Finland. *Meddelanden G. Fören. Finland* 5 (1899–1900), (7): 1–42. **Joutsen.**

Rakennustyyppejä Reski-Suomen pohjoisosasta. Koonnut O. A. Joutsen. *With Illustrations.*

On the different types of dwellings in Central Finland.

Russia—Finland. *Meddelanden G. Fören. Finland* 5 (1899–1900) (5): 1–50. **Olsson.**

En Trapa-förande torfmosse på Åland. Af P. Hj. Olsson. *With Map.*

On the post-Tertiary flora of the little marshy lake Långträsk in the parish of Hammarland, in Åland.

Russia—Odessa. **Mackie.**

Agriculture and Trade (Supplementary) of Odessa and District for the year 1898. Foreign Office, Annual No. 2366, 1899. Size 10 × 6, pp. 42. *Price* 2½*d.*

Russian Empire—Population. ———

Premier Recensement Général de la Population de l'Empire de Russie, 1897. Publication du Comité Central de Statistique, sous la rédaction de N. Troïnitsky. i. Gouvernment d'Arkhangel, cahier i. (pp. 46); xxvii. Gouvernment d'Olonets, cahier i. (pp. 36); lxxii. Province de l'Amour, cahier i. (pp. 14); lxxvi. Province Primorskaïa (du Littoral), cahier i. (pp. 44); lxxvii. Ile de Sakhaline, cahier i. (pp. 16). 1899. Size 11½ × 9. *Maps. Presented by the Comité Central de Statistique, Russia.*

Servia. **Macdonald.**

Trade of Servia for the years 1898–99. Foreign Office, Annual No. 2383, 1900. Size 9½ × 6, pp. 18. *Price* 1½*d.*

The Servian Government has recently granted concessions for the construction of a number of light railways, designed to open up the country.

Servia. *Globus* 77 (1900): 265–269. **Weigand.**

Die Rumänen in Serbien. Von Prof. Gustav Weigand.

On the languages of Servia, with a list of Rumanian place-names in that country.

Spain—Asturias. **Jones.**

The Devonian Iron Ores of Asturias, Spain. A paper read before the Institution of Mining Engineers. By J. A. Jones. Annual General Meeting at Sheffield, September 19, 1899. Excerpt from the Transactions of the Institution of Mining Engineers. London and Newcastle-upon-Tyne: A. Reid & Co., 1899. Size 10 × 6½, pp. 14. *Map and Plans. Presented by the Secretary of the Institution.*

Spain—Galicia. **Talbot.**

Trade of Corunna and District for the year 1899. Foreign Office, Annual No. 2407, 1900. Size 10 × 6, pp. 38. *Price* 2½*d.*

Spain—Malaga. **Finn.**

Trade of Malaga and District for the year 1899. Foreign Office, Annual No. 2420, 1900. Size 10 × 6, pp. 58. *Price* 3*d.*

Sweden Lakes. *Ymer* **20** (1900): 88–101. **Nerman.**

Studier öfver vattenförhållandena i svenska sjöar. Af Gustaf Nerman.

On the water-level, evaporation, and other conditions of some of the Swedish lakes.

Sweden—Plant Geography. **Kindberg.**

Öfversigt K. Vet. A. Förhand. Stockholm **56** (1899): 1003–1011.

Nya bidrag till Vermlands och Dals bryogeografi. Af N. Conr. Kindberg.

Sweden—Stockholm. **MacGregor.**

Trade of Stockholm and Eastern Coast of Sweden for the year 1899. Foreign Office, Annual No. 2401, 1900. Size 10 × 6½, pp. 40. *Price* 2½*d.*

This report contains statistics of the wood and iron production of Sweden for several years.

Switzerland. **Sartorius.**

Die Germanisierung der Rätoromanen in der Schweiz. Volkswirtschaftliche und nationalpolitische Studien. Von A. Sartorius Freiherrn v. Waltershausen.—Forschungen zur deutschen Landes- und Volkskunde . . . herausgegeben von Dr. A. Kirchhoff. Zwölfter Band, Heft 5. Stuttgart: J. Engelhorn, 1900. Size 9½ × 6½, pp. 369–474. *Map. Price* 5.20 *m.*

Turkey—Macedonia. **Cvijić.**

Die Macedonischen Seen. Ein vorläufiger Bericht von Prof. J. Cvijić. (Sonderabdruck aus dem "Abrégé" der Mittheilungen der Ung. Geogr. Gesellschaft, Band xxviii. 1900.) Budapest, 1900. Size 9½ × 6½, pp. 16. *Presented by the Author.*

On some of the lakes of Macedonia and Albania, with sketch-maps.

United Kingdom.

Mines and Quarries: General Report and Statistics for 1899. Part i.—District Statistics. Statistics of the persons employed, output, and accidents at Mines and Quarries in the United Kingdom, arranged according to the Inspection Districts. London: Eyre & Spottiswoode, 1900. Size 13½ × 8½, pp. 46. *Maps. Price* 8*d. Presented by the Home Office.*

In 1899 the total output of coal for the United Kingdom was 220,094,781 tons.

United Kingdom—England. **Baxendell.**

Borough of Southport. Meteorological Department. The Fernley Observatory, Southport. Report and Results of Observations for the year 1899. By Joseph Baxendell. Southport, 1900. Size 10 × 7½, pp. 28. *Diagram.*

United Kingdom—England. **Calvert.**

Yorkshire Ramblers' Club J. (1899–1900): 65–74, 123–133.

Gaping Ghyll Hole. By Edward Calvert. *With Plans, Sections, and Illustrations.*

Description of the exploration of Gaping Ghyll, with some striking pictures of stalactites.

United Kingdom—England. *Yorkshire Ramblers' Club J.* **1** (1900): 114–122. **Ellet.**

Long Kin Hole (West). By Frank Ellet. *With Plans and Sections.*

Describes the descent of this cavern, first to a landing at 70 feet, then a further descent of 160 feet to a second landing, below which there was a further drop of 90 feet.

United Kingdom—England. **Mill.**

A Fragment of the Geography of England. South-West Sussex. By Hugh Robert Mill, D.SC., LL.D. (From the *Geographical Journal* for March and April, 1900.) Size 10 × 6½, pp. 52. *Maps, Plans, and Illustrations.*

A critical note by Prof. W. M. Davis appears in *Science* **11** (1900), 870–871.

United Kingdom—Meteorology.

Meteorological Observations at Stations of the Second Order for the year 1896. London: Eyre & Spottiswoode. 1899. Size 12½ × 10, pp. 186. *Map. Price* 21*s. Presented by the Meteorological Office.*

United Kingdom—Scotland. **Murray and Pullar.**

A Bathymetrical Survey of the Fresh-water Lochs of Scotland. By Sir John Murray, K.C.B., and Fred. P. Pullar. (From the *Geographical Journal* for April, 1900.) Size 10 × 6½, pp. 44. *Maps and Illustrations.*

ASIA.

Afghanistan. *Imp. and Asiatic Quarterly Rev.* **10** (1900): 25–36. **Colquhoun.**

Afghanistan: the key to India. By Archibald R. Colquhoun.

Armenia—Ararat. *Z. Deutsch. u. Österreich-Alpenv.* **30** (1899): 144–163. **Ebeling.**
Der Ararat. Von Max Ebeling. *With Illustrations.*
This description of Ararat includes the account of an ascent in September, 1897.

Asia—Winds. *Meteorolog. Z.* **17** (1900): 202–207. **Woeikof.**
Der Luftdruck und die atmosphärische Cirkulation in Asien. Von A. Woeikof.

Central Asia. *La G., B.S.G. Paris* (1900): 461–464. **Deniker.**
Résultats scientifiques du voyage de MM. Roborovsky et Kozlov en Asie centrale. Par J. Deniker.

China. *J. China Br. R. Asiatic S.* 31 (1896-97): 102–115. **Carles.**
The Grand Canal of China. By W. R. Carles.
This is the complete paper contributed by Mr. Carles to the China Branch of the Royal Asiatic Society in 1895, which had been lost and an imperfect summary published in its place.

China. *La G., B.S.G. Paris* (1900): 449–460. **Vaulserre.**
Le Fleuve Bleu de Sui-fou à la hauteur de Tali-fou. Par le Vicomte de Vaulserre. *With Map and Illustrations.*

China—Foochow. **Playfair.**
Trade of Foochow for the year 1899. Foreign Office, Annual No. 2434, 1900. Size 10 × 6½, pp. 12. *Price* 1*d.*

China—Ichang. **Wilton.**
Trade of Ichang for the year 1899. Foreign Office, Annual No. 2429, 1900. Size 10 × 6, pp. 8. *Price* ½*d.*

China—Mongolia. *J. China Br. R. Asiatic S.* **31** (1896–97): 1–39. **Parker.**
Inscriptions de l'Orkhon, Déchiffrées par Vilh. Thomsen. By E. H. Parker.
A criticism of Prof. Thomsen's interpretation of the Orkhon inscription.

China—San-tu-ao. *La G., B.S.G. Paris* (1900): 385–388. **Fauvel.**
Le nouveau port de San-tou-ao. Par M. A. A. Fauvel. *With Map.*

China—Tibet. **Strachey.**
Narrative of a Journey to the Lakes Rakas-tal and Manasarowar, in Western Tibet, undertaken in September, 1848. By Lieut.-General Sir Richard Strachey, R.E., G.C.S.I., F.R.S. (From the *Geographical Journal* for February, March, and April, 1900.) Size 10 × 6½, pp. 62. *Map and Illustrations.*

China—Wuchow. **Hausser.**
Trade of Wuchow for the year 1899. Foreign Office, Annual No. 2432. 1900. Size 9½ × 6, pp. 18. *Price* 1½*d.*

China—Yangtse. *T. Liverpool G.S.* (1899): 15–20. **Little.**
The Yangtze Valley and the British Sphere. By Archibald J. Little.

India—Brahmaputra. *P. Asiatic S. Bengal* (1899): 114–116. **Waddell.**
The Physical Types and Affinities of the Wild Tribes of the Brahmaputra Valley. By Major L. A. Waddell, LL.D. (Abstract.)

India—Irrigation. *Petermanns M.* **46** (1900): 34–40, 58–61. **Jung.**
Das Bewässerungssystem in Britisch-Indien. Von Dr. Carl E. Jung.

India—Madras. ———
Report on the Administration of the Madras Presidency during the year 1898–99. Madras, 1899. Size 13½ × 8½, pp. xvi., 272, and coxii. *Maps and Diagrams.*

India—Madras—Anthropology. ———
Notes on Some of the People of Malabar; Mala Védars of Travancore; Miscellanea. (Madras Government Museum. *Bulletin*, vol. iii. No. 1.—Anthropology.) Madras, 1900. Size 8½ × 5½, pp. 92. *Plates. Presented by the Museum.*

India—North-West Frontier. *J.R. United Service I.* **44** (1900): 223–247. **Yate.**
Sixty Years of Frontier Warfare. By Major A. C. Yate. *With Plates.*
Major Yate shows that the tactics of the Pathans in warfare have remained unchanged for many years.

Indian Ocean—Seychelles. *La G., B.S.G. Paris* (1900): 289–308. **Fauvel.**
La Découverte des îles Seychelles d'après des Documents inédits. Par M. A. A. Fauvel. *With Maps.*

Part of the hitherto unpublished log of two small French vessels sent out to Mauritius to survey the neighbouring islands in 1742, and giving particulars of the discovery of the Seychelles.

Indo-China. **Pavie—Cupet.**

Mission Pavie Indo-Chine, 1879–1895. Géographie et Voyages. III. Voyages au Laos et chez les Sauvages du sud-est de l'Indo-Chine. Par le Capitaine Cupet. Introduction par Auguste Pavie. Paris: E. Leroux, 1900. Size 11½ × 9, pp. 428. *Maps and Illustrations. Price* 8*s.* 6*d.*

Japan. **Hall.**

Trade of Hiogo and Osaka for the year 1898. Foreign Office, Annual No. 2379, 1900. Size 9½ × 6½, pp. 20. *Price* 1½*d.*

Korea. *National G. Mag.* **11** (1900): 145–155. **Webster.**

Korea—the Hermit Nation. By Commander H. Webster. *With Illustrations.*

A short description from personal observation.

Malay Archipelago—Sumatra. *Globus* **77** (1900): 254–257. ———

Die Tabakkultur in Sumatra. *With Illustrations.*

Illustrations of the preparation of ground for a plantation, and the cultivation of tobacco.

Persia. *J.E. India Assoc.* **31** (1900): 5–21. **Griffin.**

Persia. By Sir Lepel Griffin, K.C.S.I.

On the present condition of Persia, and the prospect of its economic development.

Persia—Khorassan. **Whyte.**

Trade of Khorassan for the year 1898–99. Foreign Office, Annual No. 2368, 1899. Size 10 × 6½, pp. 16. *Price* 1*d.*

Persia—Teheran. *Petermanns M.* **46** (1900): 49–57. **Stahl.**

Teheran und Umgegend. Von A. F. Stahl. *With Map.*

Philippine Islands. **Doyle.**

Observatorio de Manila. Tifones del Archipiélago Filipino y mares circumvecinos 1895 y 1896. Estudio de los mismos por el P. Juan Doyle, S.J. Manila, 1899. Size 12½ × 9, pp. 110. *Diagrams. Presented by the Observatory.*

Philippine Islands. *B. American G.S.* **32** (1900): 133–150. **Schurman.**

The Philippine Islands and their People. By J. G. Schurman.

Russia—Armenia. **Friederichsen.**

Russisch Armenien und der Ararat. Von Dr. Max Friederichsen. (Separatabdruck aus den Mittheilungen der Geographischen Gesellschaft in Hamberg, Bd. xvi., 1900.) Size 9½ × 6½, pp. 16. *Map and Plate.*

Russia—Siberia. *Deutsche Rundschau G.* **22** (1900): 212–223, 266–272. **Stenin.**

Die Natur des Gebietes Jakutsk. Von Peter v. Stenin. *With Illustrations.*

Russian Central Asia. *J.S. Arts* **48** (1900): 554–568. **Colquhoun.**

Russian Central Asia: Countries and Peoples. By Archibald R. Colquhoun. *With Map.*

Russian Central Asia. *T. Liverpool G.S.* (1899): 37–43. **Rickmers.**

A Journey through the Khanate of Bokhara. By Mrs. Rickmer Rickmers.

Russian Turkestan. **Vénukoff.**

M. Vénukoff. De l'état actuel (1899) du Turkestan Russe. (In Russian.) Size 9¼ × 6½, pp. [14.] *Presented by the Author.*

Turkey. **Cuinet.**

La Turquie d'Asie. Géographie administrative, statistique, descriptive et raisonnée de chaque Province de l'Asie-Mineure. Par Vital Cuinet. Table alphabétique. Paris: E. Leroux, 1900. Size 11 × 7½, pp. 48.

The index to Cuinet's great work on Asiatic Turkey.

Turkey—Anatolia. *Deutsche Rundschau G.* **22** (1900): 241–247, 300–309. **Struck.**

Durch Pontus nach Amassia. Von Ad. Struck. *With Illustrations.*

Turkey—Anatolia. **Longworth.**

Trade of the Vilayets of Trebizond and Sivas for the year 1899. Foreign Office, Annual No. 2396, 1900. Size 10 × 6, pp. 20. *Price* 1½*d.*

Turkey—Palestine. **Dickson.**

Trade of Palestine for the year 1899. Foreign Office, Annual No. 2405, 1900. Size 10 × 6, pp. 10. *Price* 1*d.*

AFRICA.

Africa—Meteorology. *Brit. Assoc. Rep.* (1899): 448–459. ——

The Climatology of Africa. Eighth Report of a Committee.

This is referred to in the *Geographical Journal*, vol. xiv. (1899), p. 547.

Algeria—Algiers. **Hyam.**

The Illustrated Guide to Algiers. A "Practical" Handbook for Travellers. By Joseph C. Hyam. First Edition. Algiers: the Anglo-French Press Association, 1899. Size 8½ × 5½, pp. xii. and 228. *Maps and Illustrations. Presented by the Author.*

This guide-book is the work of a resident in Algiers. Many of the illustrations are of interest.

British East Africa. *Church Miss. Intelligencer* **51** (1900): 496–508. **Tucker.**

A Missionary Journey through Nkole. By Bishop Tucker.

Nkole is a district to the south-west of Koki, bordering the German territory of Karagwe, and this article describes a pioneer missionary expedition.

British East Africa—Mount Kenya. *Q.J. Geolog. S.* **56** (1900): 205–222. **Gregory.**

The Geology of Mount Kenya. By Prof. J. W. Gregory, D.SC. *With Map, Plates, and Sections.*

Dr. Gregory summarizes his conclusions thus: (1) Mount Kenya is an ancient, much-eroded volcano; the highest peak is formed of the rocks of the central plug; the site of the crater-walls is marked by the agglomerates, ashes, and tuffs of the Alpine zone. (2) The main lava series is formed of kenytes, rocks allied to passtellerites, but of a somewhat more basic type. (3) The lowest exposure of the central core is an olivine-bearing nepheline syenite. (4) The lava-sequence is: firstly, phonolite; secondly, kenytes; and finally, olivine-basalts.

British East Africa—Mount Kenya. *Alpine J.* **20** (1900): 102–110. **Mackinder.**

The Ascent of Mount Kenya. By H. J. Mackinder. *With Illustrations.*

British Somali Coast. **Sadler.**

Trade of the Somali Coast for the year 1898–99. Foreign Office, Annual No. 2384, 1900. Size 9½ × 6, pp. 40. *Price* 2½*d.*

British South Africa. **Baden-Powell.**

The Matabele Campaign, 1896. Being a Narrative of the Campaign in suppressing the Native Rising in Matabeleland and Mashonaland. By Colonel R. S. S. Baden-Powell. London: Methuen & Co., 1900. Size 9 × 6, pp. 144. *Illustrations. Price* 6*d.*

A cheap edition.

Central Africa. *Mouvement G.* **17** (1900): 183–186. **Lemaire.**

L'expédition Lemaire aux sources du Congo, du Kasai et du Zambèse. *With Map.*

Central Africa—Katanga. **Delcommune.**

Mouvement G. **17** (1900): 145–148, 160–162, 181–184.

Au Katanga: la traversée des monts Kibala.

Central Africa—Universities' Mission. ——

Report of the Universities' Mission to Central Africa. 1899. London: Office of the Mission. Size 7½ × 5, pp. 136. *Illustrations. Price* 3*d. Presented by the Mission.*

Congo State. **Poskin.**

Bilans Congolais. Étude sur la valeur commerciale du Congo par rapport à la Belgique. Par Alphonse Poskin. Bruxelles: O. Schepens & C^ie^, 1900. Size 9½ × 6, pp. 84. *Presented by the Author.*

Egypt—Alexandria. *B.S. Khédiv. G.* **5** (1900): 329–354. **Kyrillos II**

Le temple du Césaréum et l'Église patriarcale d'Alexandrie. Par S. B. Monseigneur Kyrillos II.

Egypt—Archæology. **Forbes.**
On a collection of Stone Implements in the Mayer Museum, made by Mr. H. W. Seton-Karr, in Mines of the Ancient Egyptians discovered by him on the plateaux of the Nile Valley. By Henry O. Forbes, LL.D. (Reprinted from *Bull. Liverp. Mus.*, ii., Nos. 3 and 4 (January 24, 1900). Size 10½ × 6½, pp. 77–115. *Map and Illustrations. Presented by the Author.*

Egypt—Sand-dunes. **Cornish.**
On Desert Sand-dunes bordering the Nile Delta. By Vaughan Cornish, M.Sc. (From the *Geographical Journal* for January, 1900.) Size 10 × 6½, pp. 32. *Maps and Illustrations.*

French Congo. **Fourneau.**
Renseignements Colon., Comité l'Afrique Française No. 1 (1900): 19–21.
La mission Fourneau. *With Map.*

French Congo. *Mouvement G.* 17 (1900): 133–141. **Wauters.**
Le problème du Wam. Par A.-J. Wauters. *With Maps.*
The Wam is shown as the source of the western branch of the Ubangi.

French Guinea. *Rev. Scientifique* 13 (1900): 399–401. **Leprince.**
Les Simons, sorciers de la Guinée française. Par M. Jules Leprince.

French Guinea. *B.S.G. Com. Paris* 21 (1899): 501–519. **Maclaud.**
La Guinée française, étude et souvenirs. Par M. le Docteur Maclaud. *With Map.*

French Sudan. **Bastard.**
A travers le Monde, Tour du Monde 6 (1900): 129–132, 137–140.
Une Ville du Niger: Dienné. Par M. G. Bastard. *With Illustrations.*

French Sudan. *Questions Dipl. et Colon.* 9 (1900): 399–411, 459–474. **Lorin.**
Le Soudan français. Par M. H. Lorin. *With Map.*
Description of the character of the French Sudan, and the history of its occupation.

French Sudan. *La G., B.S.G. Paris* (1900): 177–192. **Prins.**
Vers le Tchad. Une année de résidence auprès de Mohamed Abd-er-Rhaman Gaourang Sultan de Baguirmi. Avril 1898—Mai 1899. Par M. Pierre Prins.

French Sudan. *La G., B.S.G. Paris* (1900): 193–196. **Prins.**
Voyage au Dar Rounga. Par M. Pierre Prins. *With Map.*

French West Africa. *Mouvement G.* 17 (1900): 85–88, 109–113. **Wauters.**
La région des concessions dans le bassin de la Sanga. Par A.-J. Wauters. *With Map.*

French West Africa—Sanga. *Mouvement G.* 17 (1900): 121–124. **Wauters.**
La Sanga. Par A. J. Wauters.

German East Africa. *M. Deutsch. Schutzgeb.* 13 (1900): 18–39. ———
Die Fortschritte der Pendel expedition.

German East Africa. *M. Deutsch. Schutzgeb.* 13 (1900): 45–60. **Baumstark.**
Die Warangi. Von Leutnant Baumstark.

German East Africa. *M. Deutsch. Schutzgeb.* 13 (1900): 39–44. **Dantz.**
Ergebnisse der geologischen Expedition des Bergassessors Dr. Dantz.

German East Africa. *Sitzb. A.W. Berlin* (16) (1900): 191–211. **Engler.**
Uber die Vegetationsverhältnisse des Ulugurugebirges in Deutsch-Ostafrika. Zum Theil Ergebniss der Nyassasee- und Kingagebirgs-Expedition der Hermann und Elise geb. Heckmann Wentzel-Stiftung. Von A. Engler.

German East Africa. *M. Deutsch Schutzgeb.* 13 (1900): 61–75. **Richter.**
Einige weitere ethnographische Notizen über den Bezirk Bukoba. Von Hauptmann Richter.

German East Africa. *Globus* 77 (1900): 186–191, 236–240, 269–272. **Seidel.**
Photographieen aus Deutsch-Ostafrika. Erläutert von H. Seidel. *With Illustrations.*

German South-West Africa. *Globus* 77 (1900): 227–229. **Gessert.**
Das Land zwischen Inachab und Bethanien. Deutsch-Südwest-Afrika in seiner wirtschaftlichen Bedeutung. Von Ferdinand Gessert.

German South-West Africa. *Petermanns M.* **46** (1900): 18–19. **Langhans.**
Buren in Deutsch-Südwest-Afrika. Von Paul Langhans. *With Map.*
On the number of Boers in German South-West Africa.

German West Africa. *M. Deutsch. Schutzgeb.* **13** (1900): 1–3. **Gessert.**
Zur Harmattan-Frage. Von Ferdinand Gessert.

German West Africa—Kamerun. *Petermanns M.* **46** (1900): 21. **Matzat.**
Regenmessungen aus Kamerun. Von H. Matzat.

German West Africa—Togo. *Globus* **77** (1900): 281–285, 305–307. **Hupfeld.**
Die Erschliessung des Kaburelandes in Nordtogo. Von Fr. Hupfeld. *With Sketch-map.*

Ivory Coast. *Tour du Monde* **6** (1900): 73–108. **Eysséric.**
Exploration et Captivité chez les Gouros. Par M. J. Eysséric. *With Map and Illustrations.*

Madagascar. *B.S.G. Com. Paris* **21** (1899): 461–485. **Coudray.**
Madagascar au point de vue économique. Par M. Lallier du Coudray.
The author of this paper is "Directer of Civil Affairs" in Madagascar.

Madagascar—Railway. ——
Renseignements Colon., Comite l'Afrique Française No. 1 (1900): 15–18.
Les travaux publics et le chemin de fer de Madagascar. *With Map.*
On the projected railway between Tamatave and Antananarivo.

Nigeria—Yoruba. *Church Miss. Intelligencer* **51** (1900): 362–368, 443–449. **Harding.**
In Yorubaland. Journal of the Rev. T. Harding.

Portuguese East Africa. **Greville.**
Trade of Mozambique and Quilimane for the Year 1899. Foreign Office, Annual No. 2399, 1900. Size 10 × 6, pp. 16. *Price* 1*d.*
This report contains an account of the "prazo" system of trade-monopolies pursued in Portuguese Zambesia.

Portuguese East Africa—Shari River. **[Wauters.]**
Mouvement G. **17** (1900): 217–220.
Les sources du Chari. *With Map.*

Sahara. *Globus* **77** (1900): 101–105, 126–129, 144–147. **Behrens.**
Am Nordrande der Sahara. Von Dr. Wilhelm Behrens.

Sahara—In-Salah. *Rev. Française* **25** (1900): 69–78. **Demanche.**
Occupation d'In-Salah. Par M. G. Demanche. *With Map.*
In-Salah, which was occupied by the French in January, 1900, is situated very nearly midway between Algiers and Timbuktu.

Sahara—Tuat. *B. Comité l'Afrique Française* **10** (1900): 125–135. **Caix.**
La marche vers le Touât. Par M. Robert de Caix. *With Maps.*
Refers to the opening of the railway to Jenin-bu-Reszy, the most southerly point yet reached by the Algerian railways, and one from which an extension towards Tuat is possible.

South Africa. **Guyot.**
Boers and Uitlanders. By M. Yves Guyot. Translated by Alfred Moor-Radford. Weston-super-Mare: Huntley Bros., 1900. Size 8 × 5½, pp. 24. *Price* 6*d.*

South Africa. ——
Further Correspondence relating to Affairs in South Africa. (In continuation of [C. 9530], October, 1899.) January, 1900. London: Eyre & Spottiswoode, 1900. Size 13½ × 8½ pp. xiv. and 254. *Price* 2*s.* 1½*d.*

South Africa. *G.Z.* **6** (1900): 241–248. **Dove.**
Geographisches über den Kriegsschauplatz in Südafrika. Von Prof. Dr. Dove.

South Africa. *Globus* **77** (1900): 59–60, 76–80, 85–87. **Passarge.**
Durch die Karroo nach Kimberley. Reisebriefe von Dr. S. Passarge.

Spanish Guinea. *B.S.G. Madrid, Rev. G. Colon. y Mercantil* (1900): 473–479. ——
La Guinea española.

Swaziland. *J.R. Colonial I.* **31** (1900): 468–499. **Miller.**
Swaziland. By Allister M. Miller.

Transvaal. **Reed.**

The Transvaal from Without. A Brief History of the Boers and their Country. By J. Howard Reed. Reprinted from the "Manchester Evening Mail." Manchester: T. Sowler & Sons, Ltd., 1900. Size 7½ × 5, pp. 120. *Price* 3*d*. *Presented by the Author.*

Tunis—Kairwan. *Deutsche G. Blätter* **23** (1900): 1–21. **Schurtz.**

Kairuan. Von H. Schurtz.

NORTH AMERICA.

Alaska. **Filippi.**

The Ascent of Mount St. Elias [Alaska] by H.R.H. Prince Luigi Amedeo di Savoia, Duke of the Abruzzi. Narrated by Filippo de Filippi. Illustrated by Vittorio Sella, and translated by Signora Linda Villari, with the Author's supervision. London: A. Constable & Co., 1900. Size 11 × 7½, pp. xvi. and 242. *Portrait, Maps, and Illustrations. Price* 31*s*. 6*d*. *net. Presented by the Publishers.*

This sumptuous volume is the authorized English translation of the Italian work noticed in the *Journal* for May, vol. xv. (1900), p. 536. It has the advantage of having the scientific appendices revised by Prof. Ray Lankester and Prof. Judd. The translation is well done, and the reproduction of the many large photographs leaves nothing to be desired.

Canada. *A travers le Monde, Tour du Monde* **6** (1900): 181–183. **Labadie-Lagrave.**

Le Chemin de fer du Klondyke. Par M. G. Labadie-Lagrave. *With Illustration.*

The railway from Skagway was opened to the summit of White pass in February, 1899, and to Lake Bennett a few months later; it is expected to be pushed forward to White Horse rapids by August, 1900.

Canada. **Wrong and Langton.**

University of Toronto Studies. History, First Series, vol. 4. Review of Historical Publications relating to Canada for the year 1899. Edited by Prof. George M. Wrong and H. H. Langton. The University Library. Published by the Librarian, 1900. Toronto: W. Briggs; London: P. S. King & Son. Size 11 × 7½, pp. xii. and 230.

A critical bibliography of works relating in any way to the Dominion of Canada.

Canada—British Columbia. *P.A. Nat. Sci. Philadelphia* (1899): 501–511. **Vaux.**

Additional Observations on Glaciers in British Columbia. By George and William S. Vaux, Jr.

Canada—Ethnological Survey. *Brit. Assoc. Rep.* (1899): 497–584. ———

Ethnological Survey of Canada. Report of the Committee. *With Illustrations.*

Canada—Nova Scotia. **Fletcher.**

Geological Survey of Canada. Descriptive Note on the Sydney Coal Field, Cape Breton, Nova Scotia, to accompany a revised edition of the Geological Map of the Coal Field, being Sheets 133, 134, 135, N.S., summarized from the Reports of the Geological Survey of Canada, with the addition of later observations, by Hugh Fletcher, B.A. Ottawa, 1900. Size 10 × 7, pp. 16. *Maps. Presented by the Geological Survey of Canada.*

United States. *Petermanns M.* **46** (1900): 47. **Supan.**

Die Höhengrenze des Baumwuchses in den Vereinigten Staaten. Von Prof. Dr. Supan.

On the upper limit of tree-growth in the United States.

United States—California. *J. Geology* **8** (1900): 42–57. **Hershey.**

Ancient Alpine Glaciers of the Sierra Costa Mountains in California. By Oscar H. Hershey.

United States—Colorado. *J. School G.* **4** (1900): 45–51. **Dodge.**

Life on the Colorado Plateaus. By Richard E. Dodge.

United States—Immigration. **Rossi.**

L'emigrazione Italiana agli Stati Uniti nell' anno 1898–99. Rapporto del cav. Egisto Rossi.—Bollettino del Ministero degli Affari Esteri, Dicembre, 1899. Roma, 1899. Size 9½ × 6½, pp. 18.

The Italian immigrants now far outnumber those of any other European nation, the figures for 1898–99 being, in round numbers, from Italy, 76,500; Austria-Hungary, 53,300; Russia, 43,700; United Kingdom, 28,000; and Germany, 13,900.

United States—Indian Territory. **Savinien.**
Miss. Catholiques **32** (1900): 9, 20, 34, 41, 57, 69, 76, 93, 103, 118, 127.
Voyages et aventures d'un Missionnaire dans le Far-West. Par le R. P. Savinien. *With Illustrations.*

United States—Louisiana. **Vansittart.**
Trade of New Orleans and District for the Year 1899. Foreign Office, Annual No. 2382, 1900. Size 10 × 6, pp. 28. *Price* 2*d.*

United States—Meteorology. ——
United States of America. Department of Agriculture, Monthly Weather Review. Volume xxvii. Prof. Cleveland Abbe, Editor. Annual Summary for 1899. Washington: Weather Bureau, 1900. Size 12½ × 10, pp. x. and 577–597. *Charts. Presented by the U.S. Department of Agriculture.*

United States—Naval Observatory. ——
Report of the Superintendent of the United States Naval Observatory for the fiscal year ending June 30, 1899. Washington, 1899. Size 9½ × 6, pp. 28. *Presented by the U.S. Naval Observatory.*

United States—New York. **Sanderson.**
Trade of New York and District for the Year 1899. Foreign Office, Annual No. 2423, 1900. Size 10 × 6, pp. 46. *Price* 2½*d.*

United States—New York. *B. American G.S.* **32** (1900): 102–132. **Turner.**
The Physical Geography of New York State. Part xi.—The Climate of New York. By E. T. Turner. *With Map and Diagrams.*

United States—Pueblo Indians. **Hirn.**
Meddelanden G. Fören. Finland **5** (1899–1900): (2) 1–68.
Skildringar ur Pueblofolkens Konstlif. Af Yrjö Hirn. *With Illustrations.*
On the art of the Pueblo Indians.

United States—South Atlantic States. **Cöetlogon.**
Trade of Charleston and District for the Year 1899. Foreign Office, Annual No. 2394, 1900. Size 10 × 6½, pp. 22. *Price* 1½*d.*
This report contains information regarding experiments in tea culture in the southern states.

United States—Texas. *P. American Philosoph. S.* **38** (1899): 135–147. **Haupt.**
Historical Résumé of the Efforts made to demonstrate the Practicability of the Reaction Breakwater at Arausas Pass, Tex., with Results to February, 1899. By Lewis M. Haupt. *With Plates.*

United States—Texas. **Nugent.**
Trade of Texas for the Year 1899. Foreign Office, Annual No. 2391, 1900. Size 10 × 6, pp. 32. *Price* 2*d.*

United States—Washington, D.C. **Phillips.**
List of Maps and Views of Washington and District of Columbia in the Library of Congress. By P. Lee Phillips. Washington, 1900. Size 9½ × 6, pp. 78.

United States—West Central States. **Wyndham.**
Trade of Chicago and District for the Year 1899. Foreign Office, Annual No. 2414, 1900. Size 10 × 6, pp. 32. *Price* 2*d.*

CENTRAL AND SOUTH AMERICA.

Andes. *Alpine J.* **20** (1900): 81–87. **Conway.**
The Southern Andes: an Orographical Sketch. By Sir Martin Conway. *With Illustration.*
This short paper summarizes a large amount of literature as well as the author's personal observations.

Argentine Republic. *La G., B.S.G. Paris* (1900): 389–392. **Monconsin.**
Notes sur les Tehuelches et sur les indigènes de la République Argentine. Par M. P. Monconsin.

Argentine Republic. *G.Z.* **6** (1900): 297–312. **Rein.**
Erläuterungen zur Geschichte der Eroberung und Besiedelung der La Plata-Länder sowie der Einführung von Pferden und Rindvieh und deren Verwilderung. Von Prof. Johannes Rein.

Argentine Republic and Uruguay. **Garrou.**

Argentina ed Uruguay: L'allevamento del bestiame e l'industria delle carni al Plata. Rapporto del M. Garrou.—Bollettino del Ministero degli Affari Esteri, April, 1900. Roma, 1900. Size 9½ × 6½, pp. 32.

On cattle-rearing and the meat industry.

Brazil—Para. **Churchill.**

Trade of Para for the years 1898 and 1899. Foreign Office, Annual No. 2389, 1900. Size 10 × 6, pp. 10. *Price* 1*d*.

British Guiana. *J.R. Colonial I.* **31** (1900): 232–260. **im Thurn.**

British Guiana and its Boundary. By Everard F. im Thurn.

British Guiana and Venezuela. *Rev. Française* **25** (1900): 14–19. **Vasco.**

L'Arbitrage Anglo-Vénézuelien. Par M. G. Vasco. *With Map.*

Central America—Ship-Canal. ——

United States. No. 1 (1900). Convention between Her Majesty and the United States of America supplementary to the Convention of April 19, 1850, relative to the Establishment of a Communication by Ship-Canal between the Atlantic and Pacific Oceans. Signed at Washington, February 5, 1900. London: Eyre & Spottiswoode, 1900. Size 13½ × 8½, pp. 6. *Price* 1*d*.

Dutch West Indies—Curaçoa. **Jesurun.**

Trade of Curaçoa and its Dependencies for the year 1899. Foreign Office, Annual No. 2392, 1900. Size 9½ × 6, pp. 26. *Price* 2*d*.

Guatemala. *B.S. d'Études Colon.* **7** (1900): 272-282. ——

Le Caoutchouc au Guatemala. *With Illustration.*

Guatemala. *B.S. d'Études Colon.* **7** (1900): 184–196. **Morren.**

La Culture du Café au Guatemala. Extrait de l'ouvrage "Koffiecultuur in Guatemala." Par F.-W. Morren.

Nicaragua. *National G. Mag.* **11** (1900): 156–161. **Hayes.**

An Assumed Inconstancy in the Level of Lake Nicaragua: a Question of Permanency of the Nicaragua Canal. By C. Willard Hayes.

Controverts the conclusions of Prof. Heilprin as to the changes in the level of Lake Nicaragua.

Paraguay. *Globus* **77** (1900): 191–193. **Endlich.**

Zur Etymologie des Wortes "Paraguay." Von Dr. Rud. Endlich.

Suggestions as to the probable origin of the Guarani name *Paraguay*.

Patagonia. *National G. Mag.* **11** (1900): 41–55. **Hatcher.**

Some Geographic Features of Southern Patagonia, with a discussion of their origin. By J. B. Hatcher. *With Illustrations.*

This is referred to in the *Journal* for April, p. 424.

Patagonia. *American J. Sci.* **9** (1900): 85–108. **Hatcher.**

Sedimentary Rocks of Southern Patagonia. By J. B. Hatcher. *With Map.*

Venezuela—Boundary. *National G. Mag.* **11** (1900): 129–144. **Baker.**

The Anglo-Venezuelan Boundary Dispute. By Marcus Baker. *With Sketch-map and Illustrations.*

Venezuela—Ciudad Bolivar. **Lemos.**

Trade of Ciudad Bolivar for the year 1899. Foreign Office, Annual No. 2388, 1900. Size 10 × 6, pp. 6. *Price* ½*d*.

AUSTRALASIA AND PACIFIC ISLANDS.

Australia—Year-Book. **Greville.**

The Year-Book of Australia for 1900. Edited by the Hon. Edward Greville. London: Kegan Paul & Co. Size 9 × 6, pp. 860. *Maps and Illustrations. Price* 10*s*. 6*d*. *Presented by the Agent-General for New South Wales.*

Cook's Voyage—Botany. **Banks and Solander.**

Illustrations of the Botany of Captain Cook's Voyage Round the World in H.M.S. *Endeavour* in 1768–71. By the Right Hon. Sir Joseph Banks, Bart., and Dr. Daniel Solander, F.R.S. With Determinations by James Britten. Part i.—

Australian Plants. London, printed by order of the Trustees of the British Museum: Longmans & Co., 1900. Size 19½ × 13, pp. 32 [100 plates]. *Presented by the British Museum.*

The plates, now printed for the first time, were engraved on copper at the expense of Sir Joseph Banks, and in spite of their hundred years of oblivion, they have produced admirable impressions. The description of the plates is given in Latin, revised by Mr. J. Britten. Mr. George Murray, in the preface, promises a detailed introduction with the final part.

Gambier Islands. **Tregear.**

New Zealand Institute. Mangareva Dictionary, Gambier Islands. By Edward Tregear, Wellington, 1899. Size 10 × 6, pp. 122.

New Guinea. *Meteorolog. Z.* **17** (1900): 157–164. **Danckelman.**

Klima von Neu-Guinea. Von Prof. Dr. A. v. Danckelman.

New South Wales—Darling River. *P.I. Civil Engineers* **139** (1900): 259–264. **Poole.**

Rapid Preliminary Surveys on the Darling River, N.S.W. By William Poole, jun. *With Diagram.*

The survey was made for the purposes of navigation, with a view to improving the river.

New South Wales. ——

New South Wales Statistical Register for 1898 and previous years. Sydney, 1899. Size 10 × 6½, pp. viii. and 974. *Presented by the Agent-General for New South Wales.*

Pacific. *American J. Sci.* **9** (1900): 369–374. **Agassiz.**

Explorations of the *Albatross* in the Pacific. By Alexander Agassiz. IV. See also *Science* **11** (1900): 574–578.

This is noticed in the *Journal* for June, p. 619.

Pacific Ocean—Cable. ——

Canada—Australia. Further Correspondence relating to the Proposed Construction of a Cable across the Pacific Ocean. London: Eyre & Spottiswoode, 1900. Size 13 × 8½, pp. x. and 50. *Sketch-map. Price* 10½*d.*

Paumotus. *American J. Sci.* **9** (1900): 109–116. **Agassiz.**

Explorations of the *Albatross* in the Pacific. II. The Paumotus. By Alexander Agassiz.

Queensland—Almanac and Directory. **Pugh.**

Pugh's Almanac and Queensland Directory for 1900. Brisbane: Gordon & Gotch. Size 9 × 5½, pp. 1090.

Samoa. **Hunter.**

Trade of Samoa for the year 1899. Foreign Office, Annual No. 2419, 1900. Size 10 × 6½, pp. 10. *Price* 1*d.*

Samoa. *Petermanns M.* **46** (1900): 8–12. **Krämer.**

Die angeblichen Hebungen und Senkungen in Samoa, nebst einigen geographischen Notizen von Dr. Augustin Krämer.

Samoa. *M.G. Ges. Jena* **18** (1900): 1–29. **Kurze.**

Die Samoaner in der heidnischen Zeit. Von Dr. G. Kurze.

Samoa. *Globus* **77** (1900): 117–123. **Reinecke.**

Die wirtschaftliche Bedeutung Samoas und die deutschen Pflanzungen. Von Dr. Reinecke. *With Map.*

POLAR REGIONS.

Antarctic—German Expedition. *Verh. Ges. Erdk. Berlin* **27** (1900): 221–231. ——

Die Deutsche Südpolar-Expedition.

Antarctic—Scottish Expedition. *Scottish G. Mag.* **16** (1900): 352–357 **Bruce.**

The Proposed Scottish National Antarctic Expedition. By W. S. Bruce. *With Chart. Also separate copy. Presented by the Author.*

Greenland. ——

Den hvita polarvargens invandring till östra Grönland. Size 9 × 6, pp. [8]. *Sketch-map. Presented by the Author.*

On the game of Northern Greenland, especially the white wolf.

Greenland. *J. Geology* **7** (1899): 655–666. **Watson.**

Some Notes on the Lakes and Valleys of the Upper Nugsuak Peninsula, North Greenland. By Thomas L. Watson.

Norwegian Arctic Expedition. *Nautical Mag.* **69** (1900): 226–229. **Plumstead.**

Dr. Nansen and his Scientific Results. By E. Plumstead.

This paper reasserts the writer's previous opinion as to the uncertainty of certain observations by Dr. Nansen.

Spitsbergen. **Carlheim-Gyllenköld.**

Öfversigt K. Vet. A. Förhand, Stockholm **56** (1899): 631–652, 887–919.

Travaux de l'expédition suédoise au Spitzbergen, 1898, pour la mesure d'un arc du méridien. Par V. Carlheim-Gyllenköld. (Nos. 1 and 3 in French; No. 2 in Swedish.)

Spitsbergen—Hudson's Voyage. **Conway.**

Hudson's Voyage to Spitsbergen in 1607. By Sir Martin Conway. (From the *Geographical Journal* for February, 1900.) Size 10 × 6½, pp. 10. *Charts.*

MATHEMATICAL GEOGRAPHY.

Eclipse Calculations.

Local Particulars of the Total Eclipse of the Sun, 1901, May 17–18. (Nautical Almanac Circular, No. 18.) Size 10 × 6½, pp. 8. *Map.*

The central line of totality of this eclipse runs just south of the equator across Sumatra and Borneo, then curves southward through Celebes, Ceram, and the southern part of New Guinea.

Latitude Changes. **Albrecht.**

Centralbureau der Internationalen Erdmessung. Bericht über den Stand der Erforschung der Breitenvariation am Schlusse des Jahres 1899. Von Th. Albrecht. Berlin: G. Reimer. 1900. Size 11½ × 9, pp. 26. *Plate.*

Latitude Determination. *Atti R.A. Lincei, Rendiconti* **9** (1900): 189–196. **Reina.**

Determinazione astronomica di latitudine e di azimut eseguita a Monte Pisarello nel 1899. Nota del Prof. Vincenzo Reina.

On a method of fixing the latitude which gave a probable error of only ± 0″·07.

Magnetic Instrument. *Vierteljahrs. Naturfor. Ges. Zürich* **44** (1899): 246–256. **Wild.**

Ergänzungen zu meinem magnetischen Reise-Theodolith behufs unabhängiger absoluter Messungen der Horizontalintensität. Von H. Wild.

Map-reading. *Z. Deutsch. u. Österreich. Alpenv.* **30** (1899): 133–143. **Obermair.**

Einiges über Kartenlesen, Höhenmessung und Orientierung im Gelände. Von Obermair, Rgl. bayr. Oberstleutnant.

On map-reading, and the use of maps in finding one's position or one's way.

Nautical Almanac.

The Nautical Almanac and Astronomical Ephemeris for the year 1903. Also Part i. (containing such portions as are essential for Navigation). Published by order of the Lords Commissioners of the Admiralty. London: Eyre and Spottiswoode. Size 9½ × 6, pp. xiv., 646, and 18; (Part i.) xiv. and 310. *Price* 2*s.* 6*d.* Part i. 1*s.* *Presented by the Admiralty.*

Photographic Surveying. **Lee.**

Photographic Surveying. Paper by J. Bridges Lee, M.A. Read at the Royal United Service Institution, October 2, 1899. London: Published by the Society of Engineers, 1899. Size 8½ × 5½, pp. 171–202. *Illustrations. Presented by the Author.*

Position at Sea. *Ann. Hydrographie* **28** (1900): 84–89. **Börgen.**

Ueber die Auflösung des Zweihöhen-Problems nach einer Näherungsmethode von Raper, unter Benutzung der Tabelle der Mercatorschen Funktionen. Von Prof. Dr. C. Börgen.

On the solution of double-altitudes by Raper's method of approximations with the aid of a table of Mercator functions (meridional parts).

Surveying. *P.I. Civil Engineers* **139** (1900): 273–285. **Dempster.**

Railway Surveying with the Tacheometer. By H. G. Dempster. *With Plate.*

Time. *Nautical Mag.* **69** (1900): 259–271. **Allingham.**

Time and its Curious Contradictions. By William Allingham.

Time and Prime Meridian. *Riv. G. Italiana* 7 (1900): 9–19, 115–130. **Rajna.**
Appendice a una discussione su l'unificazione del calendario, il meridiano iniziale per le longitudini e l'ora universale dol Dott. Michele Rajna.

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Aurora. *C. Rd.* 130 (1900): 1276–1279. **Arctowski.**
Notice sur les aurores australes observées pendant l'hivernage de l'expédition antarctique belge. Note de M. Henryk Arctowski.

This paper is identical with that contributed by M. Arctowski to the *Geographical Journal*, and published at p. 92.

Climatology. **Woeikof.**
A. Woeikof. Climat des Hauteurs de l'Europe occidentale. [In Russian.] (Avec résumé en langue française.) St. Petersburg, 1900. Size 11 × 7½, pp. 69–212. *Diagrams. Presented by the Author.*

On the climate of the top of the Eifel tower, some other towers, and various isolated mountains in Western Europe, compared with the conditions at the level of the ground.

Geology—Age of the Earth. *Brit. Assoc. Rep.* (1899): 718–730. **Geikie.**
Section C.—Geology. Presidential Address by Sir Archibald Geikie, D.C.L., etc.

Geomorphology. **Lubbock.**
On the Configuration of the Earth's Surface, with special reference to the British Islands. By the Right Hon. Sir John Lubbock, Bart., M.P., etc. (From the *Geographical Journal* for January, 1900.) Size 10 × 6½, pp. 4.

Geomorphology. *Rev. G. Italiana* 7 (1900): 196–200. **Marinelli.**
Idee morfologiche di Carlo Gemmellaro. Nota di Olinto Marinelli.

Gemmellaro was born in Catania in 1787, studied in London under Sir Humphry Davy, spent most of his life in the study of the geology of Sicily, and died in 1866. The author claims for him priority in the application of geographical ideas to geology in the study of geomorphology.

Glaciers. *Deutsche Rundschau G.* 22 (1900): 309–316, 348–354. **Petermann.**
Gletscher und Firnmeere. Alpenkundlich-historische Studie. Von Reinhard E. Petermann. *With Illustrations.*

Glaciers. *Petermanns M.* 46 (1900): 77–81. **Richter.**
Die Gletscherkonferenz im August 1899. Von Prof. Dr. E. Richter.

Meteorology—Fogs. *Contemporary Rev.* 77 (1900): 533–540. **Bacon.**
Fogs and their teaching. By the Rev. J. M. Bacon.

Meteorology—Instrument. *Ann. Hydrographie* 28 (1900): 227–232. **Maurer.**
Prüfung eines neuen Anemometers von R. Gradenwitz und Theorie dieses Instrumentes. Von Dr. Hans Maurer.

Meteorology—Rain. **Hildebrandsson.**
K. Svensk. Vet.-A. Handlingar 32 (1899) (No. 4): 1–22.
Quelques recherches sur les centres d'action de l'atmosphère. II. La pluie. Par H. Hildebrand Hildebrandsson. *With Diagrams.*

Discusses a large number of relations between the seasonal distribution of rainfall at places the geographical positions of which are similar or contrasted.

Meteorology—Tides. *C. Rd.* 130 (1900): 861–863. **Poincaré.**
Sur la comparaison des mouvements barométriques provoqués, à la latitude 50° du méridien de Greenwich, par la marche en déclinaison du Soleil et de la Lune. Note de M. A. Poincaré.

Meteorology—Upper Atmosphere. *National G. Mag.* 11 (1900): 55–62. **Frankenfield.**
Kite Work of the Weather Bureau. By H. C. Frankenfield.

Oceanography. *Scottish G. Mag.* 16 (1900): 299–312. ——
The International Conference for Marine Research, Stockholm, 1899; and Report of the Swedish Hydrographic Commission. *With Diagrams.*

Oceanography. *Petermanns M.* 46 (1900): 61–65, 81–92. **Pettersson.**
Die Wasserzirkulation im Nordatlantischen Ozean. Von Dr. O. Pettersson. *With Charts, etc.*

Oceanography. *Petermanns M.* **46** (1900): 1–7, 25–34. **Pettersson.**
Die hydrographischen Untersuchungen des Nordatlantischen Ozeans in den Jahren 1895–1896. Von Dr. O. Pettersson. *With Charts and Diagrams.*

A comprehensive study of the movements of the water in the North Atlantic.

Oceanography—Apparatus. *Atti R.A. Lincei Rendiconti* **9** (1900): 71–72. **Guglielmo.**
Intorno ad alcuni nuovi areometri ad immersione totale, ad inclinazione variabile e a riflessione. Nota II., di G. Guglielmo.

Oceanography—Baltic. **Olsson.**
Meddelanden G. Fören. Finland **5** (1899–1900) (**4**): 1–26.
Några iakttagelser öfver hafsvattnets salthalt i Finska Skärgårdshafvet. Af P. Hj. Olsson. *With Diagrams.*

On the salinity of the sea-water in the Finnish archipelago. There is a brief summary in German.

Oceanography—Currents. **Purey-Cust.**
Report on the Undercurrents in the River Congo, West Africa, from Observations by Commander H. E. Purey-Cust, R.N., H.M.S. *Rambler*, 1899. London: J. D. Potter, 1900. Size 13 × 8½, pp. 8. *Chart. Price* 1*s. Presented by the Hydrographic Department, Admiralty.*

Oceanography—Deposits. *C. Rd.* **130** (1900): 1420–1422. **Thoulet.**
Analyse de fonds marins recueillis dans l'Iroise. Note de M. J. Thoulet.

On the method of examining the marine deposits obtained from the channel off Brest.

Oceanography—Norwegian Expedition. **Nordgaard.**
The Norwegian North-Atlantic Expedition, 1876–1878. XXVII. Zoology: Polyzoa. By O. Nordgaard. Christiania: Printed by Grøndahl & Søn, 1900. Size 15 × 11½, pp. 30. *Map and Plate. Presented by the Editorial Committee.*

Oceanography—River Entrances. **Ekman.**
Öfversigt K. Vet. A. Förhand. Stockholm **56** (1899): 479–507.
Ein Beitrag zur Erklärung und Berechnung des Stromverlaufs an Flussmündungen. Von Walfrid Ekman.

Mathematical explanation of the action of river and sea water at the entrance of rivers into the sea.

Oceanography—"Valdivia" Expedition. **Schott.**
The Oceanographical and Meteorological Work of the German *Valdivia* Expedition. By Dr. G. Schott. (From the *Geographical Journal* for May, 1900.) Size 10 × 6½, pp. 12.

Physical Geography. *M.G. Ges. Wien* **43** (1900): 3–14. **Günther.**
Die Bedeutung De la Métherie's für die Entwicklung der physikalischen Erdkunde. Von Prof. Dr. Siegmund Günther.

On the services rendered to the theory of physical geography by de la Métherie towards the end of the eighteenth century.

Sand-dunes. **Cornish.**
Formation des Dunes de Sable. Par Vaughan Cornish. (Article paru dans le numéro de Mars 1897 du *Geographical Journal.*) Traduit de l'Anglais par Émile Cammaerts. (Université Nouvelle, Institut Géographique de Bruxelles. Publication No. 2.) Bruxelles, 1900. Size 10 × 6½, pp. 38. *Illustrations. Presented by the Author.*

Seismology. *Atti R.A. Lincei, Rendiconti* **9** (1900): 204–210. **Agamennone.**
Sismoscopio elettrico a doppio effetto per le scosse sussultorie. Nota di G. Agamennone. *With Illustrations.*

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

Commercial Geography—Cables. *J.S. Arts* **48** (1900): 591–606. **Sassoon.**
Imperial Telegraphic Communication. By Sir Edward A. Sassoon, Bart., M.P.

Commercial Geography—Mines. **Foster.**
Mines and Quarries: General Report and Statistics for 1898. Part iv. Colonial and Foreign Statistics. Statistics relating to persons employed, output, and accidents at mines and quarries in the British Colonies and in Foreign Countries. Edited by C. Le Neve Foster, D.Sc., F.R.S. London: Eyre & Spottiswoode, 1900. Size 13½ × 8½, pp. 269–435. Price 1*s.* 4½*d. Presented by the Secretary of State, Home Office.*

Commercial Geography—Steam Navigation. *Brit. Assoc. Rep.* (1899): 837–853. **White.**
Section G.—Mechanical Science. Presidential Address by Sir W. H. White, K.C.B., etc.

Historical—Phenicia. **Reclus.**
La Phénicie et les Phéniciens. Par Elisée Reclus. Extrait du *Bulletin de la Société Neuchâteloise de Géographie*, tome xii. Neuchatel, 1900. Size 9 × 6½, pp. 16. *Map. Presented by the Author.*

Historical—Ships. *B.S.G. Lisboa* **17** (1899): 5–72. **Barcellos.**
Construcções de naus em Lisboa e Goa para a carreira da India no começo do seculo xvii.

Historical—The Compass. *Riv. G. Italiana* **7** (1900): 65–108. **Bertelli.**
Appunti storici intorno all' uso topografico ed astronomico della bussola fatto anticamente in Italia del P. Timoteo Bertelli.
On the ancient use of the magnetic compass in surveying operations in Italy.

Historical—Verrazano and Florin. *B.S.G. Italiana* **1** (1900): 402–409. **Peragallo.**
Ancora sulla distinta personalità di Giovanni da Verrazzano, navigatore, e di Giovanni Florin, Corsaro. Lettera del P. Peragallo.

Settlements. *G.Z.* **6** (1900): 248–262. **Schlüter.**
Die Formen der ländlichen Siedelungen. (Nach A. Meitzen.) Von Dr. Otto Schlüter. *With Map and Plate.*
On the different types of villages, with a map of Europe showing the prevalence of eight different types of settlement, generalized from the work of A. Meitzen.

BIOGRAPHY.

Edwards. *La G., B.S.G. Paris* (1900): 349–354. **Grandidier.**
Alphonse Milne Edwards (1835–1900). Par M. A. Grandidier. *With Portrait.*
M. Alphonse Milne Edwards, president of the Paris Geographical Society, was born October 13, 1835, and died April 21, 1900.

Hunter. *Fortnightly Rev.* **67** (1900): 1033–1044. **Marriott.**
A Great Anglo-Indian: Sir William Wilson Hunter and his Work. By J. A. R. Marriott.

Marinelli. *Riv. G. Italiana* **7** (1900): 241–253. **Mori and Frescura.**
Giovanni Marinelli.
Prof. Giovanni Marinelli, a distinguished Italian geographer, founder and editor of the *Revista Geografica Italiana*, was born in Udine February 28, 1846, and died at Florence, May 2, 1900.

Paulitschke. *Deutsche Rundschau G.* **22** (1900): 326–328. ——
Dr. Philipp Paulitschke. *With Portrait.*
Dr. Paulitschke was born in 1852; he travelled largely in East Africa, and died on December 11, 1899, at Vienna.

Poesche. *Deutsche Rundschau G.* **22** (1900): 278–279. ——
Dr. Theodor Poesche. *With Portrait.*
Dr. Poesche was born in Germany in 1824, emigrated to the United States in 1850, and devoted much attention to ethnographical questions. He died on December 27, 1899.

Wagner. *Petermanns M. (G. Anzeiger)* **46** (1900): 77–81. **Sievers.**
Hermann Wagner. Von W. Sievers. *With Portrait.*

GENERAL.

Army Medical Report. ——
Army Medical Department. Report for the Year 1898. With Appendix. Volume xi. London: Eyre & Spottiswoode, 1900. Size 10 × 6, pp. x. and 592. *Price* 2*s.* 7*d. Presented by the Army Medical Department.*
This report contains as an appendix a summary of the meteorological observations taken at Netley and at military stations abroad in the year 1898.

Bordeaux Geographical Society. *B.S.G. Com. Bordeaux* **26** (1900): 139–150. **Manès.**
Les vingt-cinq années de la Société de géographie commerciale de Bordeaux (1874–1899). Par M. J. Manès.

Eclipse. **Todd and Brown.**
Total Eclipse of the Sun, May 28, 1900. Prepared . . . by Prof. H. D. Todd and Prof. S. J. Brown. (Supplement to the *American Ephemeris*, 1900.) Washington: Bureau of Equipment, 1900. Size 10 × 7, pp. 32. *Charts and Illustration.*

Economics. **Levasseur.**
Comparaison du travail à la main et du travail à la machine. Par E. M. Levasseur. Paris, 1900. Size 11½ × 9, pp. 106. *Illustrations. Presented by the Author.*

Educational. *Petermanns M.* **46** (1900): 92–95. ———
Der geographische Unterricht an den deutschen Hochschulen im Sommersemester 1900.

Particulars of the courses of instruction offered in the universities and colleges of Germany in geography and allied subjects for the current term.

Educational—Methods. *National G. Mag.* **11** (1900): 62–78. **Davis.**
Practical Exercises in Geography. By Prof. W. M. Davis.

Exercises in mathematical geography for practical use in schools.

Geographical Chronology. *Deutsche G. Blätter* **23** (1900): 58–63. **Wolkenhauer.**
Die Entwicklung der Geographie im xix Jahrhundert in einigen Merkzahlen. Von W. Wolkenhauer.

Geographical Congress. **Lecleroq.**
Le septième congrès international de géographie à Berlin. Par Jules Leclercq. (Extrait des Bull. de l'Acad. roy. de Belgique (Classe des lettres, etc.), No. 11, pp. 791–800, 1899.) Size 9 × 6. *Presented by the Author.*

Geographical Definitions. *J. School G.* **4** (1900): 52–58. **Curtin.**
Some Common Geographical Definitions. By Margaret H. Curtin.

Geographical Progress. *La G., B.S.G. Paris* (1900): 197–228. **Hulot.**
Rapport sur les progrès de la Géographie en 1899. Par le Baron Hulot. *With Maps.*

Geographical Terminology. *Riv. G. Italiana* **7** (1900): 131–136. **Marinelli.**
Superficie geologiche e superficie geografiche. A proposito di alcuni termini d'uso promiscuo. Per Olinto Marinelli.

Geography. **Lespagnol.**
La conception actuelle de la Géographie. Leçon d'ouverture du cours de Géographie professé á la Faculté des Letters. Par M. G. Lespagnol. Lyon: A. Storck & C^ie^, 1900. Size 10 × 6½, pp. 20. *Presented by the Author.*

On the modern conception of geography—the opening lecture of a course at Lyons.

German Colonies. **Townley.**
German Colonial Estimates for 1900. Foreign Office, Miscellaneous, No. 524, 1900. Size 10 × 6½, pp. 12. *Price* 1*d.*

The imperial exchequer is asked to provide £1,300,000 towards the expenses of the German colonies for 1900.

German Colonies—Bibliography. **Brose.**
Die deutsche Koloniallitteratur im Jahre 1898. Zusammengestellt von Maximilian Brose. Sonder-Heft der Beiträge zur Kolonialpolitik und Kolonialwirtschaft, herausgegeben von der Deutschen Kolonialgesellschaft. Berlin: W. Süsserott, 1900. Size 10 × 7, pp. 38. *Price* 80 *pf. Presented by the Deutschen Kolonialgesellschaft.*

The titles are classified under the names of the respective colonies.

Ice-breaker. **Makaroff.**
The *Yermak* Ice-breaker. By Vice-Admiral Makaroff. (From the *Geographical Journal* for January, 1900.) Size 10 × 6½, pp. 14. *Chart and Illustrations.*

Lyons Geographical Society. ———
Société de Géographie de Lyon et de la Région Lyonnaise. Notice historique. (Supplément au Bulletin de la Société de Géographie de Lyon du 1^er^ Avril, 1900.) Lyon, 1900. Size 10 × 6½, pp. 76. *Frontispiece. Presented by the Société de Géographie de Lyon.*

Meteorological Congress. ———
Atti del IV. Congresso Meteorologico Italiano promosso dalla Società Meteorologica Italiana tenuto a Torino dal 12 al 15 settembre 1898. Torino, 1899. Size 7½ × 5, pp. 168. *Presented by the Società Meteorologica Italiana.*

Mountaineer's Equipment.

Catalogue of Equipment for Mountaineers. Exhibited at the Alpine Club, December, 1899. London. Size 9 × 6, pp. 48. *Illustrations. Presented by the Alpine Club.*

Place-Names. *Blackwood's Mag.* 167 (1900): 527–540. **Maxwell.**

Names of Places. By Sir Herbert Maxwell, Bart., M.P.

A popular paper on the historical changes of ancient place-names in the British Islands, with suggestions as to the normal evolution of names.

Slavery.

Sixty Years against Slavery. A Brief Record of the Work and Aims of the British and Foreign Anti-Slavery Society, 1839–1899. With an article on the Abolition of the Legal Status of Slavery. By Joseph G. Alexander, LL.B. London: Published at the Offices of the Society. Size 9 × 7½, pp. 16.

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This sheet of Bartholomew's Reduced Ordnance Survey of Ireland, like the others of the series, shows the relief of the land by tinted contours. It also gives, as an inset, a small plan of Belfast.

Paris. **Fasquelle.**

Plan de l'Exposition Universelle de 1900, et de son annexe de Vincennes, d'après les documents officiels. Scale 400 feet to an inch. Paris: Eugene Fasquelle.

This is a popular plan of the Paris exhibition buildings and grounds, printed in colours, and will doubtless be useful to visitors.

ASIA.

Asia. **Service Géographique de l'Armée, Paris.**

Asie. Scale 1: 1,000,000 or 15·8 stat. miles to an inch. Sheet: Nagasaki. Service Géographique de l'Armée, Paris. *Price 1·25 fr.*

In view of what is now happening in the Far East, and of events which are likely to take place there in the immediate future, the map, of which this sheet forms a section, is likely to prove extremely useful. It is clearly printed in colours, roads in red, water blue, and railways and lettering in black. The relief is shown by hill shading, and depths of the water are indicated in metres by contour lines and figures. This sheet shows southern Japan in the neighbourhood of Nagasaki, and the north-west corner contains the south-east portion of Korea, thus completing the map of that country, of which parts have previously appeared on other sheets.

China. **Madrolle.**

Atlas de l'Empire Chinois. Par Cl. Madrolle. Scale 1: 1,000,000 or 15·8 stat. miles to an inch. Sheets: Ta-tsién-loû, Iûn-nân. Paris: Millet.

Each of these sheets represents an area of about 38,500 square miles; the first includes the country around Yunnan fu, the capital of Yunnan, and the second Ta-sien lu and neighbourhood, and the region to the west, in the province of Sechuan. They form part of Madrolle's Atlas de l'Empire Chinois, and are drawn on the scale of 1: 1,000,000, in accordance with the map of the Pavie mission. There is no hill shading, and the maps are somewhat roughly printed in blue and black. Travellers' names are given, and altitudes are indicated in metres.

China, Japan, and Korea. **Bartholomew.**

Bartholomew's Special Map of China, Japan, and Korea. Scale 1: 6,000,000 or 95 stat. miles to an inch. J. Bartholomew & Co., Edinburgh, 1900. *Price 2s. mounted on cloth. Presented by the Publishers.*

In addition to the general map, this sheet contains, as insets, a small map of the greater part of Asia, showing means of communication between the principal Chinese ports and other parts of the continent; a map showing the spheres of European influence in China; a plan of Hong Kong, with the country as far as Canton, and indicating the new boundary of British territory on the mainland; a plan of Peking and the neighbourhood, including Tiën-tsin fu and Taku forts, with the railway to Peking, which is, however, not quite correctly shown; a plan of Peking itself, on a somewhat larger scale, and a small plan of Tokio bay, showing Tokio and Yokohama. This sheet will be very useful for general reference in connection with the present crisis in China.

AFRICA.

Africa. **Service Géographique de l'Armée, Paris.**

Carte d'Afrique. Scale 1: 2,000,000 or 31·6 stat. miles to an inch. Sheets: 18, Gao-Gao; 25, Sokoto; 26, Kouka. Service Géographique de l'Armée, Paris. *Price 1 fr. each sheet.*

These are revised editions of three sheets of this very useful map of Africa, published by the Service Géographique de l'Armée, Paris, and include the course of the Niger from the upper part of its great bend to just below Lokoja, where it is joined by the Benué, the whole of the latter river, Lake Chad, and portions of the adjacent territories.

Algeria. **Service Géographique de l'Armée, Paris.**

Carte d'Algerie. Scale 1: 50,000 or 0·8 stat. mile to an inch. Sheet 136: Boghar. Service Géographique de l'Armée, Paris. *Price* 1.50 *fr.*

AMERICA.

Peru. **Raimondi.**

Mapa del Peru. Scale 1: 500,000 or 7·8 stat. miles to an inch. A. Raimondi. Engraved and printed by Erhard Bros., Paris. Sheets: 23, Amapo; 27, Pelechuco; 29, Arequipa.

South America. **Bartholomew.**

Commercial Map of South America. Scale 1: 10,000,000 or 158 stat. miles to an inch. J. Bartholomew & Co., Edinburgh, 1900. *Price* 3*s. mounted on cloth. Presented by the Publishers.*

This is a good general map of South America, and, although on a rather small scale, contains a great deal of useful information, especially in connection with railways, steamer lines and the navigability of the rivers. The latter is a very important subject, and has evidently received considerable attention from Mr. John Samson, of the *South American Journal*, who has revised the map. The extent to which a river is navigable for large trading boats is clearly indicated by its course being shown in a broad blue line, while those sections that are only navigable for small boats are given in a dotted blue line. The new boundary between British Guiana and Venezuela is laid down; but it would have been better if no attempt had been made to show those parts of the frontier between Chile and the Argentine Republic that are now under discussion. True, in certain sections this boundary is not shown by a hard line, as is the case with others, but there are regions where, under the present circumstances, it would have been better to have left it out altogether. The line could easily have been added in a later edition of the map. The general direction of that part of this frontier which has been definitely arranged in the Puna de Atacama is fairly correctly laid down, but there are several mistakes in the location of peaks over which the line should pass; for instance, it should cross the summit of the Cerro de Rincon, but here that peak is shown some distance to the west of the boundary.

Several small plans of South American ports are given as insets.

Texas. **Hill.**

Map of Texas and parts of adjoining territories. Scale 1: 1,584,000 or 25 stat. miles to an inch. Robert T. Hill, 1899. United States Geological Survey, Washington. *Presented by the U.S. Geological Survey.*

Contour lines in brown, at intervals of 250 feet, are shown on this map, by which means the relief of Texas is very clearly indicated; the water is in blue, and the lettering, railways, etc., black. The map is reduced from the surveys made in connection with the United States Geological Survey, and special attention has been given to the physical features; but as a map for general reference it will be found rather disappointing, owing to the fact that so few place-names are shown.

GENERAL.

Historical Atlas. **Putzger.**

F.W. Putzger's Historischer Schul-Atlas zur alten, mittleren und neuen Geschichte in 67 Haupt- und 71 Nebenkarten. Herausgegeben von Alfred Baldamus und Ernst Schwabe. Ausgeführt in der Geographischen Anstalt von Velhagen and Klasing in Leipzig. Bidefeld und Leipzig. Verlag von Velhagen and Klasing. *Price* 2 *m.* 50 *pf.*

That this little historical school atlas has reached its twenty-fourth edition is in itself sufficient guarantee for its general merits and usefulness. It now contains altogether thirty-seven maps, besides numerous plans and insets, illustrating the history of the world in ancient, mediæval, and modern times, which are preceded by brief explanatory letterpress. Germany naturally figures more prominently than any other country, and the British Isles are only taken into consideration in connection with the history of the neighbouring countries of Europe; thus, from an English point of view, the atlas must be considered incomplete.

World. **The 'Times.'**

The *Times* Atlas (new edition), containing 132 pages of maps, and comprising 196 maps, and an alphabetical index to 150,000 names. Published at the office of the *Times*, London, 1900. *Price* 35*s*. *Presented by the 'Times.'*

During the five years that have elapsed since the publication of the first edition of the '*Times* Atlas' in 1895, our geographical knowledge has made considerable advances; regions that were then but very imperfectly known have been surveyed, besides which many important alterations have been made to boundaries. Thus a new edition of this atlas was needed if the work was to be kept up to date, and this has lately made its appearance. The number of maps has been increased from 117 to 132, and numerous fresh insets have been added. The new maps include geological maps of England, Scotland, and Ireland; a general map of the Malay archipelago; one of North-East China and Korea; a fairly large-scale map of the United States and parts of adjacent countries on four sheets; maps of Central and South America, the latter of which is in two sheets; and maps of Australia and New Zealand. These maps form a valuable addition, and in several cases they cancel the small-scale maps of the same countries which appeared in the first edition.

Probably the exigencies of printing have prevented the latest available information being incorporated in some of the maps. In the map of North-East Africa, the surveys made under the superintendence of Colonel J. R. L. Macdonald, R.E., between the upper Nile and Lake Rudolf have not been utilized, while on the same map the Sudan railway is shown only as far as Berber. The Central Asian railways, shown on map No. 81, appear to be somewhat confused, as exactly the same sign is used for the projected railway, which may or may not in years to come connect Kandahar with Herat, as that showing the continuation of the Transcaspian railway from Samarkand *viâ* Khokand to Andijan and Marghilan, and the branch to Tashkent, which are actually working. In the map of British North America, the important town of Rossland, in Southern British Columbia, should be indicated. In the next edition no doubt there will be an indication of the Crow's Nest railway to the south of the Canadian Pacific main line, as also the boundary between British Guiana and Venezuela, which has now been definitely settled by the arbitration of last October.

On some of the maps an attempt has been made to indicate the ocean depths by contour lines, and the idea so far is commendable, but why select such contours as 27 fathoms, 510 fathoms, etc., instead of even hundreds and thousands, as is usually done? Then again, it is usual, and certainly more natural, to arrange the blue tinting between the contours so that it increases in intensity with the increase of depth of the water, but in this atlas the opposite arrangement is adopted, with a result apt to tend to confusion, at any rate until the eye becomes accustomed to the change. On the earlier edition the more natural system is followed, and the alteration cannot be considered an improvement.

CHARTS.

United States Charts. **U.S. Hydrographic Office.**

Pilot Charts of the North Pacific Ocean for July, 1900. Published at the U.S. Hydrographic Office, Washington, D.C. *Presented by the U.S. Hydrographic Office.*

PHOTOGRAPHS.

Vesuvius. **Matteucci.**

Four photographs showing Eruption of Mount Vesuvius, May 13, 1900. By Prof. R. V. Matteucci. *Presented by Prof. R. V. Matteucci.*

These four interesting photographs, presented by Prof. R. V. Matteucci of Naples, illustrate the eruption of Vesuvius in May last. They are as follows: (1) Guide's small house, damaged by the eruption; (2, 3) Showing eruption of Vesuvius; (4) Large piece of rock thrown up by the eruption.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.

SKETCH MAP

OF

CENTRAL AFRICA

BETWEEN THE REGION OF LAKE TANGANYIKA AND ALBERT EDWARD NYANZA

illustrating the journey of

EWART S. GROGAN

1899.

Scale of Miles

0 10 20 30

Nat. scale 1:1,000,000 or 15·78 miles = 1 inch.

Route ——— Heights in feet.

30′ 29 30′

0 30′ 1 30′ 2 30′ 3

ALBERT EDWARD NYANZA

3600 (Grogan.)

bush

village

sparse population

Nyamira

Sebea 3680

Vichumbi

plain 3600

forest

Lagoon

village

NYABINGA

Hiri

village

WUTAKA

Gwendo 3650

papyrus

BUKOMA

forest

village

banana

Rusohuru

Fuko

IJOM

MUHEBSU

MUSHARI

Kahanga

BWISHA

Kahangas

GISHARI

grass hills

Mt Eyres extinct vol.

Mt Watt extinct vol.

Mt Kandt extinct vol.

Mt Gahinga (Kirunga.) active vol.

extinct craters

young forest

KAMERONDE

extinct craters

Gwanna's vil.

BUGOIE

Mt Hembe a Bugogo

Kashale

many small streams

LAKE KIVU

4850 (Grogan)

LUBENGERA

RUANDA

High Watershed

ITAMBI

Kwijwi I.

Mt Dorothy

Mt Margaret

Mt Hilda

Sources of the Nile

MUKINYAGA

Ishangi 5950

Mt Sybil

Gertrude Bight

BUNYAPUNGU

Mt Msimu

Mt Mutafu

Kasi

Kashyur

Nyakagondo

Rusizi

Bugumoro

Bulamata

plain

URUNDI

Kombi

Kyanda

Kajagga

Usambara

2878 (Gorgan)

L. TANGANYIKA

Published by the Royal Geograp

30 30′ 31 0

L. RUISAMBRA
Katwe
Kazinga
KAIHURA
Sparse population
village
VISEGWE
villages
bush
water pools
Rutshuru
Ruisi
Kagera
Nyavalongo
MEDITERRANEAN SEA
Alexandria
CAIRO
Siut
RED SEA
R. NILE
Wady Halfa
Abu Hamed
Sunkin
Berber
Shendi
Atbara
Khartum
B. el Azrek
B. el Abiad
L. Tana
SHILLUK
Fashoda
B. el Abiad
Sobat
NUER
DINKA
B. el Jebel
Marsh
Bor
Gondokoro
Lado
BARI
Ft Berkeley
MADI
Dufile
Wadelai
A'Mudo
SHULI
L. Rudolf
LORE
Albert Nyanza
Victoria Nile
Mt Ruwenzori
Albert Edward Nyanza
VICTORIA NYANZA
L. Kivu
Usambara
Ujiji
LAKE TANGANYIKA
Mtowa
L. Rukwa
Kituta
Stevenson's Road
Mambwe
Karonga
LAKE NYASA
R. Zambezi
Metope
L. Shirwa
Blantyre
Katunga
Shire
Chirona
Chiperoni
MANGANJA
Falls of the Zambesi
RHODESIA
Gorongosa
Buzi
Beira
Pungwe R.
Limpopo R.
Delagoa Bay
Lorenzo Marques
Scale of Miles
0 100 200 300
Mt Chamberlain
extinct volcano
Watt
extinct vol
TOMBA
ugogo
A
Nile

30 30′ 31 30′